117

TRANSCRIPT OF RECORD

Supreme Court of the United States

OCTOBER TERM, 1931

No. 722

UTAH POWER AND LIGHT COMPANY, APPELLANT,

vs.

EMMITT PFOST, COMMISSIONER OF LAW ENFORCEMENT OF THE STATE OF IDAHO, ET AL.

APPEAL FROM THE DISTRICT COURT OF THE UNITED STATES FOR THE DISTRICT OF IDAHO

FILED FEBRUARY 23, 1932

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IN UNITED STATES DISTRICT COURT FOR THE DISTRICT OF IDAHO, SOUTHERN DIVISION

In Equity. No. 1621

UTAH POWER & LIGHT COMPANY, a Corporation, Plaintiff

against

EMMITT PFOST, Commissioner of Law Enforcement of the State of Idaho, and FRED J. BABCOCK, Attorney General of the State of Idaho, Defendants

BILL OF COMPLAINT—Filed June 15, 1931

To the Honorable the Judges of the District Court of the United States for the District of Idaho; Southern Division:

Utah Power & Light Company, a corporation duly organized and existing under the laws of the State of Maine, and a citizen and resident of said State, files its Bill of Complaint against the above named defendants, whose citizenship and residence are hereinafter particularly alleged, and thereupon complains and says:

1. The plaintiff Utah Power & Light Company is a corporation duly organized and existing under the laws of the State of Maine, and a citizen and resident of said State, with its principal place of business and residence at Augusta, Kennebec County, in the said State of Maine, but doing business in the States of Idaho, Utah and Wyoming under and by virtue of compliance with the laws of each of such States, having filed certified copies of its Articles of Incorporation, and designated its statutory agents in each of said States in accordance with the laws thereof. The principal place of business of said plaintiff in Idaho is at Idaho Falls, Bonneville County, and the business of plaintiff in the States of Idaho, Utah and Wyoming is that of generating, transmitting and distributing electric power and energy as a public utility for barter, sale and exchange to users or consumers thereof in each of such States, and in interstate commerce between said States.

2. The defendant Emmitt Pfost is the legally appointed, qualified and acting Commissioner of Law Enforcement of [fol. 4] the State of Idaho and is hereinafter referred to as "Commissioner", and the defendant Fred J. Babcock is the legally elected, qualified and acting Attorney General of the State of Idaho and is hereinafter referred to as "Attorney General". Each of said defendants is a citizen of the State of Idaho and a resident of the Southern Division of Idaho.

3. This suit is a civil suit in equity; the matter in controversy herein exceeds, exclusive of interest and costs, the sum or value of $3,000, and arises under the Constitution of the United States, and is between citizens of different States.

4. The Extraordinary Session of the Legislature of the State of Idaho, convened on the 6th day of March, 1931, and adjourned sine die on the 13th day of March, 1931, and at said Session enacted an act entitled "An Act levying a license tax of one half mill per kilowatt hour on electricity and electrical energy generated, manufactured or produced in the State of Idaho for barter, sale or exchange; and providing for the collection and distribution of such tax; and for forms and procedure to be used and followed; requiring reports of the production of electricity and electrical energy and the furnishing of equipment for measuring same; prescribing penalties for violation of this act; exempting from such license tax the electricity and electrical energy actually used for pumping water for irrigation purposes on lands in the State of Idaho and providing that such exemptions shall accrue to the benefit of the consumer of such electricity and electrical energy; prescribing the duties of the State Commissioner of Law Enforcement under this Act, requiring him to give a bond for the faithful performance of said duties and fixing the amount thereof, and making an appropriation with which to carry out its purposes", which said Act received the approval of the Governor of the State of Idaho on March 17, 1931, and became Chapter 3 of the Laws of said Session. A copy of said Act, marked "Exhibit A", is attached to and made a part of this Bill of Complaint, and is hereinafter referred to as "Tax Act". The said defendant Commissioner is charged with the ad-

ministration, and he and the said defendant Attorney General are charged with the enforcement of said Tax Act.

5. The defendant Commissioner, acting under the authority of said Tax Act, has prescribed and prepared, or will forthwith prescribe and prepare, and will furnish to plaintiff, forms of statement for tax returns thereunder, and plaintiff prays leave to exhibit said forms when same are furnished. The Commissioner in and by said forms aforesaid, has construed and will construe said Tax Act to impose a tax based on all electricity generated or produced within the State of Idaho, and not solely upon electricity generated or produced for barter, sale or exchange, and to impose a tax upon all such electricity, including that generated or produced in interstate commerce.

[fol. 5] 6. The Commissioner has notified plaintiff that it is subject to the taxes imposed by said Tax Act, that it must comply with all the terms thereof and make a statement under oath, as provided therein, of all kilowatt hours of electricity generated, manufactured or produced by it in the State of Idaho for the calendar month of June, 1931, and for each calendar month thereafter, that such return must be filed and said tax must be paid on or before the 15th day of July, 1931, and thereafter on or before the 15th day of each succeeding calendar month, and that the Commissioner intends, if the plaintiff should fail to file such statement within the time prescribed by said Tax Act, to compute the taxes apparently due, and ascertain and assess against the plaintiff the tax provided by said Tax Act in respect of all electricity generated, manufactured or produced by plaintiff within the State of Idaho. Said Tax Act purports to authorize said Commissioner to inspect the books and records of the plaintiff.

7. Unless plaintiff files such statement and pays said tax on or before July 15, 1931, and monthly thereafter, defendant Commissioner, pursuant to his apparent duty under said Tax Act, will thereupon sue to collect such tax with a penalty of three times the amount of the tax alleged to be due, and will seek to enjoin plaintiff from generating or producing electricity within the State of Idaho while such tax remains delinquent, and that it is the intention of the defendant Attorney General, and it is by law made his duty, to bring

such suits against plaintiff upon request of defendant Commissioner. Plaintiff is informed and believes that such Tax Act, and the tax thereby sought to be levied and collected and the penalties and injunctive process thereby imposed and authorized, are unlawful and void, and in violation of the Constitution of the United Sates and of the Constitution of the State of Idaho, for the reasons hereinafter stated.

8. Plaintiff owns and operates an interconnected electric power system consisting of generating stations, transmission and distribution lines and other electrical equipment located in the States of Idaho, Utah and Wyoming, whereby energy in the electrical form is generated, transmitted, distributed and delivered in barter, sale and exchange, to its customers in each of said States, including, but not limited to, persons, firms, corporations, and irrigation districts, pumping water by electricity for irrigation purposes, to be used on lands in the State of Idaho, and in interstate commerce between said States of Idaho, Utah and Wyoming. As a part of said interconnected system, plaintiff owns and operates several hydroelectric stations located in the State of Idaho; among others certain stations on the Bear River known as Soda, Grace, Cove and Oneida, to which specific reference is hereinafter made.

During the year 1930, there was generated or produced on and by that part of said system located in Idaho, in conjunction with said interconnected system, electricity measured through integrating watt-hour recording meters in terms of 236,601,000 kilowatt hours.

[fol. 6] Of said electircity so generated or produced by plaintiff, the following was used within the State of Idaho:

Sales in Idaho	Approximately	231,796,000 kwh.*
Transmission, distribution and sub-station losses pertaining to business in Idaho	"	4,100,000 kwh.
Station use in Idaho for plaintiff's own purposes and not for barter, sale or exchange	"	6,750,000 kwh.

* Kilowatt hours.

The remainder of said electricity as the same was generated or produced and transmitted by plaintiff, measured in terms of 201,955,000 kilowatt hours, was generated directly in interstate commerce between the States of Idaho, Utah and Wyoming by means of said interconnected system. The larger part of the station use in Idaho, was in conjunction with, and incidental to, such generation of electricity in Interstate Commerce.

The electrical energy so generated and transmitted in interstate commerce, subject to transmission and distribution losses of approximately 20 per cent., was sold by plaintiff in the States of Utah and Wyoming under contracts theretofore entered into between said Company and its customers in said States, and was necessary for the performance of said contracts.

Said Soda, Grace, Cove and Oneida stations, located in Idaho, have a combined capacity of 95,500 kilowatts and are connected directly to three 130,000 volt transmission lines extending directly from said stations through Idaho to a station named "Wheelon" in Utah, and thence to a receiving and switching station named "Terminal" near Salt Lake City, Utah. There is no use of electricity from said 130,000 volt lines in Idaho, the first use therefrom being at Wheelon, Utah, and the principal use of said electricity being at points in Utah and Wyoming after the same has passed through said Terminal station.

The local customer uses in Idaho from said Idaho stations are from separate outgoing lines segregated at the generating bus, and are relatively unimportant. Not to exceed two per cent of the energy at said station goes to serve said local customers. Said stations in Idaho were constructed directly, and, in fact, solely for Utah service (since extended to Wyoming), and the local customer uses in Idaho have been connected to said stations to gain the economy and service convenience that, except for these major stations, would be impracticable. In addition to electricity transmitted over said 130,000 volt lines, some electricity from said stations also reaches Utah over 44,000 volt lines from the Grace station.

The operations above described for the year 1930 are similar to and descriptive of plaintiff's operations as the same are now practiced during 1931, and plaintiff's opera-

tions in the future will be substantially the same, and in [fol. 7] substantially the same proportions as between intrastate and interstate commerce.

9. Upon the above described property, and in connection with its business aforesaid, plaintiff has been and will continue to be required to pay annually, taxes imposed under the general tax laws of Idaho, as follows:

(a) A general property tax levied annually upon all property, real and personal, of the plaintiff, situated within the State of Idaho, in proportion to its value, in common with all other property in the State not exempt from taxation. Plaintiff has paid such general property tax upon its property in Idaho annually; this tax for the year 1930 amounted to $412,090.07 and was based upon an assessed valuation of $11,088,009; and a like assessment will be made and a like tax levied and paid for the calander year 1931, and subsequent years.

(b) An annual license tax for the right to do business in the State of Idaho based upon plaintiff's authorized capital stock. Plaintiff has paid this tax annually, since its incorporation and qualification to do business in Idaho.

(c) An income tax, effective July 1, 1931, levied and collected upon the net income of plaintiff in Idaho.

None of the foregoing tax laws under which the taxes enumerated in this paragraph are levied and assessed against the plaintiff, have been repealed and all remain in full force and effect.

10. In addition to the taxes aforesaid levied against and collected from the plaintiff, another tax is sought to be imposed and levied against plaintiff by virtue of said Tax Act. Plaintiff in the year 1930, generated or produced within that part of its interconnected system located in Idaho, electricity measured in terms of 236,601,000 kilowatt hours, and for the year 1931 and thereafter will generate or produce approximately a like amount of electricity in the said State and upon said system. Under said Tax Act and in accordance with the interpretation placed thereon by the Commissioner, plaintiff would have paid for the year 1930, had said Tax Act been then effective, the sum of $18,300, and if said Tax Act is valid and plaintiff produces within the State of Idaho for

the year 1931 and thereafter a like amount of electricity to that so produced by it in the year 1930, it will pay in addition to the taxes mentioned in the preceding paragraph, the sum of approximately $69,000 for the last seven months of 1931, and approximately $120,000 per year thereafter. The gross business of the plaintiff in Idaho for the year 1930, from the production and sale of electricity within said State amounted to approximately $735,000, and will continue in approximately that amount annually thereafter.

11. The Tax Act violates Article I, Section 8, Clause 3 of the Constitution of the United States in the following respects.

With respect to electricity generated by plaintiff in Idaho on its interconnected interstate system operated in inter- [fol. 8] state commerce, as hereinbefore described: (a) If the tax attempted to be imposed by said Tax Act is laid on kilowatt hours generated as property, it is a tax on property after the same has become a part of interstate commerce, and is void as laying a burden on such interstate commerce; (b) If the tax attempted to be imposed by said Tax Act is not a property tax, but one upon the business of generating, manufacturing, or producing electricity or electrical energy, it constitutes as to the above described business in interstate commerce a direct interference with and burden upon the business of conducting interstate commerce, and upon the commerce so conducted.

The Tax Act contains no provision or means for measuring or computing separately the amount of the tax as applied to intrastate as distinguished from interstate commerce, and is therefore void in its entirety. Nor can the plaintiff withdraw from or discontinue its intrastate business.

12. The terms "generation", "manufacture" and "production" as applied to energy in the electrical form are merely synonymous designations applied to one aspect of the process of transferring energy from some source in nature (such as falling water) to some point where it may be usefully applied. The various electrical facilities used in said process are purely transferring devices, and the entire combined process—electric, magnetic and mechanical—is integral, continuous and essentially simultaneous,

as electricity travels with the speed of light—186,000 miles per second.

There is a continuous electrical and electro-magnetic path between the windings in the generator and the windings in the consumer's motor (or between the generator windings and the filament in an electric lamp or the electrodes in an electro-chemical cell). The entire electric system is a device for transferring the force (as of falling water) to, and applying it at, the point where it is to be utilized. Except as, and to the extent that, energy is called for and used at the final point of utilization, the electric generator neither receives from the water wheel shaft nor delivers to the electric transmission lines any energy other than that necessary to hold the equipment under constant rotation and electric charge in instant readiness to serve.

The power being transferred at any instant along the electric circuit existing between an electric generator at one place and a receiving device at another place is calculable at any point in the circuit from the electrical pressure or voltage between wires and the magnitude and characteristics of the electric current circulating in the wires, and is commonly expressed in kilowatts.

The "kilowatt-hour", the usual unit for measuring energy in the electrical form, is a mathematical product of the power relation in the electric circuit between a generator and a receiving device, measured in kilowatts, and the duration of time over which that relation is utilized, measured in hours.

In the case of plaintiff's system "electricity and electrical energy" is "generated, manufactured or produced" in its interstate Idaho-Utah-Wyoming system only if, as and when the combined demand of its customers, in Utah and [fol. 9] Wyoming, causes the turbine gates in the Idaho generating stations to open, thus permitting the energy of the falling water exerted within the turbine to be instantly transferred through the electric generator and other parts of the interstate electric system to the customers' motors, lights or other equipment. The entire process is a continuous inseparable transfer of energy from the water, through the generators, along the transmission lines, to the customers' points of use (in Utah and Wyoming) at a rate of speed of approximately 186,000 miles per second.

Each customer's demand (or use) occurs just as and when the customer desires, and is effected by his act of switching on lights, motors, ranges and other electrical appliances. As the demand is made, the electricity demanded is instantly, and as an immediate and direct result of said demand, generated at plaintiff's said stations specifically and solely for, and in response to, that demand and use. The demands of plaintiff's various customers in Utah and Wyoming occur on various secondary transmission and distribution lines in said States, which demands are brought partially together through local facilities and completely consolidated at Terminal station near Salt Lake City, Utah. There is thus created a continuing combined demand on the Idaho generating stations which exists throughout the Idaho-Utah-Wyoming system. The incidence of this combined demand as between the several stations on the system, whether in Idaho or in Utah, is, within the limits of the effective capacity of the several stations, under the control of plaintiff's Dispatcher at Terminal station, under whose directions the different stations may be placed in readiness for service.

Power or electricity generated at various Utah stations is likewise transmitted to Terminal station, and there commingled on common buses with power or electricity generated at the Idaho stations. Between Terminal and the customers' points of use, electricity or power can no longer be identified by its source, as in Idaho or Utah. The actual combined demand effective at Terminal station upon the 130,000 volt transmission line, automatically manifests itself on the various generators previously placed in readiness for service, in the manner hereinabove described, without point of rest between generation and Terminal station. Similarly, power or electricity transmitted from the Idaho stations to Utah over the 44,000 volt transmission lines extending from the Grace station, as described in Paragraph 8 hereof, enters in Utah a similar system interconnected with generating stations in Utah, and is distributed through substations, at which there is a similar loss of identity in Utah as between power generated in Idaho and in Utah.

The "recording watt-hour meter or meters, or other suitable instrument for measuring the electricity or electric energy produced", which is required by said Tax Act to be

maintained "at the point or points of production" on the plaintiff's interconnected Idaho-Utah-Wyoming system, will record, and must record, expressed in terms of kilowatt hours, the mathematical product of the power relation in the electric circuit between the generators of said system in Idaho and the receiving devices in Utah and Wyoming [fol. 10] (as their demands are combined at Terminal station), measured in kilowatts, and the duration of time over which that relation is utilized, measured in hours, including, in the measurement, the energy expended in the system, to meet losses and other necessary uses incident to the delivery of energy to such receiving devices. The measurement, therefore, upon which the tax sought to be imposed by said Tax Act is based, is, and will be, a direct measure of the magnitude and duration of interstate commerce in electricity or electric energy over said system, after said commerce has commenced and during the course thereof.

The generation of electricity is not the production of a commodity or material thing; it is a part of the process of rendering a service, and no electricity can be commercially generated or produced except as an inseparable part of the service rendered. Likewise the "Kilowatt hour" is the measure of such service and not a measure or unit of material things.

13. Said Tax Act violates the 14th Amendment of the Constitution of the United States in that it denies to this plaintiff engaged in the business of generating or producing electricity and electrical energy in the State of Idaho, the equal protection of the laws and renders it and its property liable to be taken without due process of law, all in violation of the 14th Amendment of the Constitution of the United States in that the penalties fixed for the failure to comply with any of the provisions of the Tax Act, including the making of such reports as are required by the Tax Act, and the payment of the tax imposed and levied thereunder, and for failure to open for inspection the books and records of the company, as is provided by Section 8 of the Tax Act, are so excessive as to intimidate, coerce and compel any persons coming under the Tax Act, including this plaintiff, to comply with the provisions of said Tax Act without the freedom of resorting to the courts to test the validity of the provisions of said Tax Act.

14. Said Tax Act further violates the 14th Amendment of the Constitution of the United States in that it denies to this plaintiff, so engaged in the business of generating or producing electricity and electrical energy within the State of Idaho, the equal protection of the laws and renders its property liable to be taken without due process of law in that Section 5 of the Tax Act compels appropriation and payment of money of the plaintiff for the sole and exclusive benefit of private individuals without compensation therefor.

15. Said Tax Act violates the Constitution of the State of Idaho in the following particulars:

(a) It is in conflict with Article III, Section 16 of said Constitution, which provides that every act shall embrace but one subject and matters properly connected therewith, which subject shall be expressed in the title, in that:

1. Both title and the act contain two subjects, i. e. (a) the levying of a license tax for revenue purposes; and (b) the application of credits on the electric bills of certain consumers of electricity.

[fol. 11] 2. The subject of the act is not expressed in the title in that the title purports to levy "a license tax of one-half mill per kilowatt hour on electricity and electrical energy generated, manufactured or produced in the State of Idaho for barter, sale or exchange", whereas the act purports to levy upon the producer of electrical energy for barter, sale or exchange a tax of one-half mill on all kilowatt hours generated, manufactured or produced by him. Plaintiff as hereinbefore recited, has generated and will generate electrical energy substantially in excess of that generated for barter, sale or exchange, and the tax sought to be levied in the act is substantially different and greater than that expressed in the title.

3. The subject of the act is not expressed in the title in that the title provides that there shall be exempted from the tax "the electricity and electrical energy actually used for pumping water for irrigation purposes on lands in the State of Idaho", whereas the act provides "that the full amount of such license tax which would have been due from such producer of electricity" shall be so exempt. These

quantities are entirely different in that the energy "actually used" is substantially less than the energy taxable at the "place of production."

(b) The act in exempting from the tax the electricity and electrical energy "used for pumping water for irrigation purposes to be used on lands in the State of Idaho" and providing that a sum equal to the tax that would otherwise be paid by the producer, shall be paid to the consumer—

(1) violates Section 13 of Article I of said Constitution which provides that no person shall be deprived of property without due process of law,

(2) constitutes the levying of a tax for other than a public purpose, and in effect constitutes the levying of a tax for the benefit of an individual, in violation of Article VIII, Section 2, and Article VII, Section 2, of said Constitution,

(3) imposes a tax for the benefit of municipal corporations, to wit: irrigation districts which pump water by means of electricity supplied by plaintiff for irrigation purposes, in violation of Article VII, Section 6 of said Constitution, which provides the Legislature shall not impose taxes for the purposes of any county, city, town or other municipal corporation.

(c) If said tax is a license tax it constitutes a second license tax imposed in the same year for the same purpose in violation of Article VII, Section 2 of said Constitution which provides that "the Legislature may also impose a license tax (both upon natural persons and upon corporations, other than municipal, doing business in this State); also a per capita tax", in that plaintiff is subjected to and has paid the license tax described in Subdivision (b) of Paragraph 9 of this Bill, and also in that the tax sought to be imposed extends to business without the State.

[fol. 12] (d) If the tax imposed, or attempted to be imposed, by said act is a property tax levied on the kilowatt hour as property, the act, as applied to plaintiff, violates Section 2, Article VII of the Constitution in that it does not provide for the levying of a tax according to valuation, and Section 5 of Article VII in that it does not provide for the levying of a tax uniform upon the same class of sub-

jects within the territorial limits of the authority levying the tax, nor for the levying of such tax as will secure a just valuation of property for taxation purposes, and provides no method for determining or equalizing the value for taxation of the property taxed, and constitutes duplicate or double taxation of the same property.

(e) That said Extraordinary Session of the Legislature was called in violation of the provisions of Section 9 of Article IV of said Constitution in that at the time said call was made by the Governor there existed no "extraordinary occasion" justifying the calling of such Extraordinary Session. Said call was made prior to the adjournment of the regular session of the Legislature, for the purpose of considering matters that had theretofore been considered at said regular session, and no extraordinary occasion or condition arose or could have arisen between the adjournment of the regular and the convening of such Extraordinary Session; further, said Tax Act for raising revenue could not lawfully be considered or acted upon at an Extraordinary Session. The regular session of the Legislature, which adjourned immediately prior to the convening of the Extraordinary Session, had made all appropriations for the ensuing biennium until the convening of the next regular session, and had levied a general ad valorem tax sufficient to meet all expenses of the Government of the State for said biennium.

16. Said Tax Act contains so many uncertainties and ambiguities that the provisions thereof cannot be certainly, definitely or equitably enforced, and the taxes proposed to be levied thereunder, cannot be certainly, definitely or equitably levied on said kilowatt hours, or against said plaintiff so engaged in the manufacture, generation or production of electricity and electrical energy for barter, sale or exchange. Particularly is said Tax Act uncertain and ambiguous in the following respects:

(a) It cannot be determined from said act whether a tax is to be levied on all kilowatt hours generated or produced within the State of Idaho, including those used in the taxpayer's own operations or on such kilowatt hours as are generated or produced in the State of Idaho for barter, sale or exchange.

(b) Section 2 of said act provides that "taxes not paid on the due date shall become delinquent and shall bear interest from said due date at the rate of ten per cent per annum", while Section 8 of said act provides that any producer "who shall fail to pay the license tax herein provided for, or any part thereof, when due, shall be liable for three times the amount of the unpaid or delinquent tax. * * *"

[fol. 13] (c) Section 5 of said act provides that the "full amount of such license tax which would have been due from such producers of electricity or electrical energy, if such exemptions (irrigation pumping) had not been made, shall be credited annually for the year in which the exemptions are made on the power bill to the consumer by the producer of such electricity and electrical energy furnishing such power."

To determine the "full amount of such license tax which would have been due from the producer", the computation of the amount of the exemption must be based on the measurement made at the place of production. Billings to the irrigation user are based on measurements made at the place of use. These two points of measurement, i. e., at place of production and place of use, are sometimes separated by many miles, and intervening transmission and distribution losses may amount to so much as 20 per cent., hence the amount upon which the tax would have been due is different from and greater than the amount which forms the basis of producer's billing to the user. No provision is made by the act for computing the exemption upon the amount of electricity measured at the point of use and no provision is made for determining the relation between such points of use and production.

Any enforcement of said Tax Act by the defendants will depend on an arbitrary construction thereof, and will constitute a deprivation of property without due process of law in violation of Section 14, Article I of the Constitution of Idaho, as well as of the 14th Amendment to the Constitution of the United States.

17. Defendants, Commissioner and Attorney General, propose and have threatened to enforce, and, will endeavor to enforce, through appropriate action and the imposition of fines and penalties prescribed by the Tax Act, the col-

lection of the taxes thereby attempted to be imposed upon the plaintiff, notwithstanding the manifest invalidity of such Tax Act, as hereinbefore alleged. If the defendants so do, the plaintiff will suffer irreparable injury and will be subjected to a multiplicity of suits, will be threatened with heavy and severe penalties and has no plain, adequate and complete remedy at law but is remediless except through the equitable interposition of this court in that (a) suit for collection of taxes and penalties would be brought for each and every month that plaintiff failed to pay said tax; (b) the penalties are so unreasonable, burdensome and excessive that plaintiff could not safely refuse to pay the tax as the same is demanded; (c) there is no provision of the Statutes of Idaho under which the plaintiff could pay the tax under protest and recover back the amount so paid, but any payment so made would be credited into the general fund of the State and its reimbursement could be effected only through subsequent act of the Legislature. Therefore, plaintiff invokes the injunctive processes of this court to enjoin enforcement of the Tax Act against it, its agents, servants and employees, as hereinafter prayed, in order to prevent irreparable injury and avoid multiplicity of suits and imposition of unlawful penalties, which it might otherwise suffer.

[fol. 14] Wherefore this plaintiff prays—

That a writ of preliminary injunction issue from this court under the seal thereof directed to the said defendants and each of them, restraining and enjoining the said defendants and each of them, and/or their successors in office, and all persons acting in aid of said defendants or either of them or their successors in office, from in any way carrying out or enforcing the provisions of the said Tax Act hereinbefore described, either by way of requiring the plaintiff to make out the returns specified in said Tax Act, assessing, imposing or seeking to collect said tax by suit, either with or without the penalties specified in said Tax Act, or by enjoining the plaintiff from generating electricity and carrying on its business, or otherwise seeking to enforce the same, pending the final determination of this suit, and that upon final hearing said injunction be made permanent and said Tax Act declared null and void, and for

such other or further relief as may appear just and equitable.

To which end the plaintiff prays that Your Honors grant to plaintiff a writ of subpœna and respondendum, issuing out of and under the seal of this Honorable Court to be directed to each of the said defendants, commanding them and each of them on a certain day, and under appropriate penalties to be therein named, to appear before this Honorable Court, and then and there make full, true, direct and perfect answer (but not under oath or affirmation, the benefit whereof is hereby expressly waived by the plaintiff) to all and singular the premises and the allegations of this Bill of Complaint, and further to stand, do, perform and abide by such further order and decree as to Your Honors may seem just and meet.

And plaintiff will ever pray, etc.

Utah Power & Light Company, by Geo. B. Thomas, Vice-President, Salt Lake City, Utah. Attest: R. H. Jones, Asst. Secretary. (Seal.) Howley & Worthwine, Residence and Post Office Address Boise, Idaho; Merrill & Merrill, Residence and Post Office Address Pocatello, Idaho, Solicitors for plaintiff. Geo. R. Corey, Salt Lake City, Utah; John F. MacLane, New York, N. Y., Counsel.

[fol. 15] *Duly sworn to by George B. Thomas. Jurat omitted in printing.*

[fol. 16] EXHIBIT "A" TO BILL OF COMPLAINT

Chapter 3 (H. B. No. 3)

An act levying a license tax of one half mill per kilowatt hour on electricity and electrical energy generated, manufactured or produced in the State of Idaho for barter, sale or exchange; and providing for the collection and distribution of such tax; and for forms and procedure to be used and followed; requiring reports of the production of electricity and electrical energy and the furnishing of equipment for measuring same; prescribing penalties for violation of this Act; exempting from such license tax the electricity and electrical energy actually used for

pumping water for irrigation purposes on lands in the State of Idaho and providing that such exemptions shall accrue to the benefit of the consumer of such electricity and electrical energy; prescribing the duties of the State Commissioner of Law Enforcement under this Act, requiring him to give a bond for the faithful performance of said duties and fixing the amount thereof, and making an appropriation with which to carry out its purposes.

Be it enacted by the Legislature of the State of Idaho:

Section 1. That in addition to the licenses and taxes now provided by law, each and every individual, firm, partnership, common law trust, corporation, association or other organization, now engaged or hereafter to engage in the generation, manufacture or production of electricity and electrical energy in the State of Idaho, either through water power or by any other means for barter, sale, or exchange, and hereinafter referred to as the "producer", shall on or before the fifteenth day of each calendar month, beginning with the 15th day of July, 1931, render a statement to the Commissioner of Law Enforcement of the State of Idaho of all electricity and electrical energy generated, manufactured or produced by him or it in the State of Idaho, during the preceding calendar month and therewith pay a license tax of one-half (½) mill per kilowatt hour on all such electricity and electrical energy so generated, manufactured or produced, measured at the place of production and as shown on such statement in the manner and within the time hereinafter provided.

Section 2. Said license tax shall be remitted with the statement and paid on or before the fifteenth day of each month, beginning with July 15, 1931, to the Commissioner [fol. 17] of Law Enforcement, who shall receipt therefor and promptly turn same over to the State Treasurer, as other receipts of his office, and the State Treasurer shall place same to the credit of the General Fund. Taxes not paid on the due date shall become delinquent and shall bear interest from said due date at the rate of ten per cent per annum.

Section 3. On or before July 15, 1931, every producer referred to in Section 1 of this Act engaged in the pro-

duction, generation or manufacture of electricity or electrical energy, shall make and file with the Commissioner of Law Enforcement of the State of Idaho, on forms prescribed, prepared and furnished by the Commissioner of Law Enforcement, a duly acknowledged and verified certificate which shall contain: (a) the name under which the producer is transacting business in the State of Idaho; (b) his or its post office address and principal place of business within the state; (c) the address and location of his or its production plants or stations in Idaho; (d) the name and address of the managing agent; (e) the names and addresses of the several persons composing any firm or partnership constituting the producer, and, if a corporation, the corporate name under which it is authorized to transact business and the names and addresses of its officers, directors, resident general agent and attorney in fact; (f) certified copies of any papers necessary to show that such producer has complied with the laws of the State of Idaho in order to transact business in Idaho.

Section 4. Every such producer shall on or before the fifteenth day of each calendar month, beginning with July 15, 1931, and monthly thereafter, render to the Commissioner of Law Enforcement of the State of Idaho on forms prescribed, prepared and furnished by the Commissioner of Law Enforcement, a statement sworn to by the manager, president, secretary or treasurer of such producer, showing the number of kilowatt hours of electricity and electrical energy produced, generated or manufactured by him or it during the preceding calendar month. For the purpose of measuring such electricity and electrical energy such producer shall keep and maintain at the point or points of production, a recording watt hour meter or meters, or other suitable instrument for measuring the electricity or electrical energy produced, of a type to be approved by the Commissioner of Law Enforcement, the recordings therefrom to be kept on file at the principal place of business of such producer within the State of Idaho and same together with the books and records of such producer shall be subject to the inspection of the Commissioner of Law Enforcement, his deputies or assistants, during reasonable business hours.

Section 5. All electricity and electrical energy used for pumping water for irrigation purposes to be used on lands

in the State of Idaho is exempt from the provisions of this act, except in cases where the water so pumped is sold or rented to such irrigated lands. Provided, the exemption here given shall accrue to the benefit of the consumer of such electricity or electrical energy. Provided further that [fol. 18] the full amount of such license tax which would have been due from such producers of electricity and electrical energy, if such exemptions had not been made, shall be credited annually for the year in which the exemptions are made on the power bill to the consumer by the producer of such electricity and electrical energy, furnishing such power, and such producer shall include a statement of the amount of electricity and electrical energy exempted by this section, furnished by it for the purpose of pumping water for irrigation purposes on lands in the State of Idaho, to the Commissioner of Law Enforcement of the State of Idaho as a part of the statement required by Section 1 of this Act, together with a statement of the credits made on the power bills to the consumers of such electricity and electrical energy for the pumping of water for irrigation to be used on lands in the State of Idaho.

Section 6. Any producer of electricity or electrical energy referred to in Section 1 of this Act who shall hereafter engage in the generation, production or manufacture of electricity or electrical energy shall immediately upon purchasing or acquiring the plant, or installing equipment therefore, comply with the requirements of Section 3 of this Act.

Section 7. Any person, officer, partner, agent or representative of any producer referred to in Section 1 of this Act, who shall make any false statement or affiadvit in any certificate report or statement herein required to be made to the Commissioner of Law Enforcement hereunder shall be deemed guilty of perjury and upon conviction shall be punished by imprisonment in the state penitentiary not less than one nor more than fourteen years.

Section 8. Any producer referred to in Section 1 of this Act who shall violate any of the provisions of this Act or who shall fail to pay the license tax herein provided for, or any part thereof, when due shall be liable for three times the amount of the unpaid or delinquent tax, in a civil action

instituted for that purpose in any court of competent jurisdiction, by the Commissioner of Law Enforcement in the name of the State of Idaho, and in such suit upon application of the State, an injunction may be issued, without requiring any bond, restraining the defendant from continuing to produce electricity or electrical energy so long as any taxes due hereunder from said defendant remain delinquent.

Section 9. The State Treasurer shall, on or before the twentieth day of August of each year, beginning with August 20, 1931, prepare and furnish to the chairman of the State Board of Equalization a statement showing the total amount paid into the General Fund for the year ending August 15th of such year from the license tax provided by this Act, and the State Board of Equalization shall deduct such total amount so paid in determining the ad valorem tax for state purposes on real and personal property.

Section 10. In addition to any bond provided by law to be given by the Commissioner of Law Enforcement for the faithful performance of his duties, he shall give a fidelity [fols. 19-26a] bond in the penal sum of $50,000.00 to the State of Idaho, in the form and manner provided by law for similar bonds of state officers, and duly conditioned for the faithful performance of his official duties prescribed by this act.

Section 11. If any section or provision of this Act be adjudged unconstitutional or invalid for any reason, such adjudication shall not affect the validity of this Act as a whole or of any section or provision thereof which is not specifically so adjudged unconstitutional or invalid.

Section 12. There is hereby appropriated out of any moneys in the General Fund, not otherwise appropriated, the sum of Fifteen Thousand Dollars ($15,000.00) or so much thereof as may be necessary, with which to carry out the purposes of this act.

Approved March 17, 1931.

[fol. 27] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

MOTION TO DISMISS—Filed July 2, 1931

Come now the defendants, Emmitt Pfost, Commissioner of Law Enforcement of the State of Idaho, and Fred J. Babcock, Attorney General of the State of Idaho, and move the court to dismiss the bill of complaint herein upon the following grounds:

I

It does not appear from the averments of said bill of complaint that the statute challenged as unconstitutional is in contravention of any designated provision of the State or Federal Constitution.

II

Said Bill of complaint does not set forth facts sufficient to constitute a valid cause of action in equity against these defendants, Emmitt Pfost, Commissioner of Law Enforcement of the State of Idaho, and Fred J. Babcock, Attorney General of the State of Idaho; or either of them.

[fol. 28]

III

That as to each of the following separate paragraphs, defendants move separately and severally to dismiss so much of said bill of complaint as therein set forth, to-wit:

(1) So much of said bill of complaint as is contained in paragraph 11 thereof which seeks injunctive relief on the ground that said act contravenes Article I, Section 8, Clause 3 of the Constitution of the United States.

(2) So much of said bill of complaint as is contained in paragraph 13 thereof which seeks injunctive relief on the ground that said tax act violates the 14th Amendment of the Constitution of the United States in that it denies to plaintiff the equal protection of the laws and renders its property liable to be taken without due process of law.

(3) So much of said bill of complaint as is contained in part 1 of sub-paragraph (a) of paragraph 15 thereof which

seeks injunctive relief on the ground that said tax act is in contravention of Article III, Section 16 of the Constitution of the State of Idaho, in that said act and the title thereto contain two subjects.

(4) So much of said bill of complaint as is contained in part 2 of sub-paragraph (a) of paragraph 15 thereof which seeks injunctive relief on the ground that the subject of the act is not expressed in the title with relation to the energy to be taxed.

(5) So much of said bill of complaint as is contained in part 3 of sub-paragraph (a) of paragraph 15 thereof which seeks injunctive relief on the ground that the subject of the act is not expressed in the title with relation to the amount of energy to be exempted from the tax.

[fol. 29] (6) So much of said bill of complaint as is contained in sub-paragraph (b) of paragraph 15 thereof which seeks injunctive relief on the ground that the exemption of said energy is in violation of Section 13 of Article I, Section 2 of Article VIII, Section 2 of Article VII, and Section 2, of Article VII of the Constitution of the State of Idaho.

(7) So much of said bill of complaint as is contained in sub-paragraph (c) of paragraph 15 thereof which seeks injunctive relief on the ground that said tax is in violation of Section 2, Article VII of the Constitution of the State of Idaho, in that it imposes double taxation.

(8) So much of said bill of complaint as is contained in sub-paragraph (d) of paragraph 15 thereof which seeks injunctive relief on the ground that said tax is in violation of Section 2, Article VII of the Constitution of the State of Idaho.

(9) So much of said bill of complaint as is contained in sub-paragraph (d) of paragraph 15 thereof which seeks injunctive relief on the ground that said tax is in violation of Section 5, Article VII of the Constitution of the State of Idaho.

(10) So much of said bill of complaint as is contained in sub-paragraph (e) of paragraph 15 thereof which seeks injunctive relief on the ground that said tax act was not passed at any lawful session of the Legislature of the State of Idaho.

(11) So much of said bill of complaint as is contained in sub-paragraph (a) of paragraph 16 thereof which seeks injunctive relief on the ground that said tax cannot be certainly, definitely or equitabley imposed with relation to the amount of energy upon which a tax is levied.

[fol. 30] (12) So much of said bill of complaint as is contained in sub-paragraph (b) of paragraph 16 thereof which seeks injunctive relief on the ground that said tax cannot be certainly, definitely or equitable imposed with relation to the penalties for which plaintiff may or will become liable.

(13) So much of said bill of complaint as is contained in sub-paragraph (c) of paragraph 16 thereof which seeks injunctive relief on the ground that said tax cannot be certainly, definitely or equitable imposed with relation to the amount of energy exempt from the tax.

For the reasons and upon the grounds:

(a) That each of such parts of said bill of complaint fails to set forth facts sufficient to constitute or tending to sustain any valid cause of action in equity against these defendants, or either of them.

(b) It does not appear from the averments of any of such parts of said bill of complaint considered separately that the statute challenged as unconstitutional is in contravention of any designated provision of the State or Federal Constitution.

Wherefore defendants pray that the whole of said bill of complaint may be dismissed, and as to each and every of said paragraphs and parts of paragraphs above designated, that so much of said bill of complaint as therein contained be dismissed, and that the said defendants may be hence dismissed with their costs in their behalf incurred. [fols. 31 & 32] Defendants further pray that the time to answer or file any further proper pleading be extended pending the determination of the present motion, and for such other and further relief as to the court may seem just.

Dated this 1st day of July, 1931.

Fred J. Babcock, Attorney General of the State of Idaho; Sidman I. Barber, Assistant Attorney General; Maurice H. Greene, Assistant Attorney General, Solicitors for Defendant.

Service of the foregoing and receipt of copy acknowledged this 2nd day of July, 1931.

Hawley & Worthwine, Merrill & Merrill, John F. MacLane, Geo. Corey.

[fol. 33] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT, DISTRICT OF IDAHO, SOUTHERN DIVISION

No. 1621

UTAH POWER & LIGHT COMPANY, a Corporation, Plaintiff,

vs.

EMMITT PFOST, Commissioner of Law Enforcement of the State of Idaho, and Fred J. Babcock, Attorney General of the State of Idaho, Defendants

Hawley & Worthwine, of Boise, Idaho; Merrill & Merrill, of Pocatello, Idaho (Geo. R. Corey, of Salt Lake City, Utah; and John H. MacLane, of New York City, New York, of Counsel), for plaintiff, Utah Power & Light Company.

Fred J. Babcock, Attorney General of Idaho, and Sidman I. Barber and Maurice H. Greene, Assistants Attorney General, for defendants.

Before Sawtelle, Circuit Judge, and Webster and Cavanah, District Judges, as a Statutory Three-judge Court.

MEMORANDUM OPINION—Filed August 20, 1931

CAVANAH, District Judge:

The legislature of Idaho at an extraordinary session enacted an Act requiring those engaged in the generation and production of electricity and electrical energy in the state for barter, sale or exchange, to pay a license tax of one-half mill per kilowatt hour on such electricity and directed that it be measured at the place of production by recording watt hour meters or other suitable instruments. [fol. 34] The plaintiff, Utah Power & Light Company, en-

gaged in generating, transmitting and distributing electrical power and energy as a public utility in the state of Idaho, Utah and Wyoming, brings this suit challenging the constitutionality of the Act on the grounds that it violates the equal protection, due process and commerce clauses of the constitution of the United States and conflicts with and violates certain provisions of the constitution of the State of Idaho, and applies for an interlocutory injunction restraining the enforcement of the Act pending the decree on final hearing.

Numerous reasons are asserted by the plaintiff as to why the Act should fall as controvening the provisions of the federal and state constitutions, and among which there is first presented the question as to whether or not the Act violates the Fourteenth Amendment of the Constitution of the United States and Section 13 of Article 1 of the Idaho Constitution which have similar inhibitions against taking property without due process of law, as it is urged that it denies the plaintiff equal protection of the law and renders its property liable to be taken without due process of law. The penalty prescribed in the Act and the exceptions provided in Section 5 thereof, plaintiff asserts, furnishes the basis for this claim. Generally it has been said that the courts have no interest in the policy of the state revenue laws so long as equal protection is not denied and property is not taken without due process of law and it is reasonable and not arbitrary. The Fourteenth Amendment, "only requires the same means and methods to be applied impartially to all the constituents of a class so that the law shall operate equally and uniformly upon all persons in similar circumstances." Kentucky Railroad Tax Cases 115 U. S. 321; Magoun v. Illinois Trust and Bank 170 U. S. 283; State v. Harn et al. 27 Ida. 782, 152 Pac. 275; and [fol. 35] this policy may be carried out in a revenue as well as a police measure. The constitutional provision was not intended to compel the state to adopt an iron rule of equal taxation for it may exempt certain classes of property from taxation at all, so long as the legislature proceeds within reasonable limits. The fact that the state in adjusting its revenue laws has exempted a certain class does not deny the equal protection of the law and this right to classify for taxation is granted to impose an occupation tax if equally

applicable to all within the class. Hope Natural Gas Company v. Hall et al. 274 U. S. 284; Heisler v. Thomas Collier Co. et al. 260 U. S. 245; Armour Packing Co. v. Lacey 200 U. S. 226; Citizens Telephone Co. v. Fuller 229 U. S. 322; Clark v. Titusville 184 U. S. 329; American Manufacturing Co. v. City of St. Louis 250 U. S. 459. But it is urged that as section 5 of the Act exempts all electrical energy used for pumping irrigation water for Idaho lands except where the water so pumped is sold or rented to such lands on condition that the exemption which accrues to the benefit of the consumer of such electricity and the full amount of such tax which would have been used from such production if the exemption had not been made, should be granted annually for the year in which the exemptions are made on the power bill to the consumer by the producer of such electricity, the statute is the taking of private property for private purposes in violation of the provisions of the state constitution and not due process of law. A similar statute of the state exempting property used for irrigation pumping purposes from a general property tax of an electrical company was held by the Supreme Court of Idaho as not controvening the state constitution for the reason that it did not levy a tax, but created an exemption, and that the credit of the state was not thereby extended as there was no obligation on the part of the state created by the state and the fact [fol. 36] that, "the transfer of the ultimate benefit of the exemption to the consumer does not change its character as an exemption statute or require us to hold that it grants a subsidy to private individuals in a manner forbidden by the constitution." Williams v. Baldridge 48 Ida. 618, 284 Pac. 603. Accepting then the decision of the State Supreme Court in interpreting its state constitution as controlling, the federal court will not interfere in the matter of exemption from state taxation under the Fourteenth Amendment as such matters of classification are of state policy to be determined by the state. Florida Central and Peninsular Railroad Co. v. Reynolds 183 U. S. 471; Bell's Gap Railroad Co. v. Pennsylvania 134 U. S. 232.

The suggestion is made that because the tax is not reflected in present rates the exemption reduces its charges to its consumers for electrical energy for pumping water for irrigation purposes and thereby results in a reduction

of its rates, and would be the taking of property without due process of law is without merit when we consider that under its powers of rate-making the Public Utilities Commission of the State takes into consideration all taxes paid and exemptions required to be allowed in fixing the rates to be charged, and this being the case there can be no confiscation of plaintiff's property as this tax exemption would in effect be borne by all the consumers, thereby relieving plaintiff from paying it at all.

As to the penalty provided in the Act, it is sufficient to say that it is not involved in the present suit as there is no attempt to now enforce it. It is separate from the other provisions of the Act and the Act contains a section that if any provision of it be held unconstitutional for any reason it shall not affect the validity of the Act as a whole, or of any provision which is not specifically adjudged invalid, [fol. 37] so therefore, in advance of an attempt to enforce the penalty we need not pass upon its validity. Ohio Tax Cases 232 U. S. 576; Grenada Lumber Co. v. State of Mississippi 217 U. S. 433; Western Union Telegraph Co. v. City of Richmond, 224 U. S. 160; Louisville & Nashville Railroad v. Garrett et al 231 U. S. 298.

Even if Sections 5 and 11 of the Act are unconstitutional the court is not warranted in declaring the whole Act void unless all the provisions are connected in subject matter and depend on each other, for it is settled that an exemption or the penalty clause in a statute may be invalid, yet the rest of the statute remains unaffected and could be carried out. Gillesby v. Board of Commissioners 17 Ida. 586, 107 Pac. 71; State v. Bird 29 Ida. 47, 156 Pac. 1140; Little Rock & Ft. Smith Ry. Co. v. Worthen 120 U. S. 97.

Thus viewing the Act we have no doubt that even if sections 5 and 11 are excluded there will remain a workable statute whose provisions will not depend upon the sections excluded and the Act would be capable of enforcement.

The fact that the Act failed of passage at the regular session of the legislature without having contained in it the exemption provision and was thereafter adopted with the exemption clause, would not justify the court in presuming that the legislature would not have passed it without the exemption provision for it does not appear that the Act would have been passed at the regular session with the

exemption provision, or that it ever came to a vote. It is evident that the primary purpose of the Act was to require all engaged in the generation and production of electricity and electrical energy in the state to pay a tax and that it operates alike upon all who are so engaged. The tax required to be paid is uniform throughout the state and equal upon the same class similarly situate which removes [fol. 38] from it the charge that it infringes upon the equality clause.

The charge that the Act imposes a double license for the same purpose in violation of Section 5 Article 7 of the State Constitution is not well founded when we come to consider the two statutes involved, for Section 4782 of the Idaho Compiled Statutes requires the payment of an annual license tax upon the right to do business as a corporation in the state and affects all corporations alike, while the tax imposed by the Act here affects all who generates electrical energy, whether incorporated or not, and is an excise tax upon the right to engage in that particular business. The rights are not the same as one relates to a tax upon the franchise of the corporation as a privilege for being a corporation in the state and the other for the privilege of conducting the business contemplated by the charter of the corporation. It is not requiring the payment of a double tax. Home Ins. Co. v. New York State 134 U. S. 594; Gundling v. Chicago 177 U. S. 183; Baldwin Tool Works v. Blue et al. 240 Fed. 202. Nor is the Act subject to the objection that if the tax is a property tax it also violates the constitution of the state in that it does not provide for the levying of a tax according to valuation and uniform upon the same class of property for the reason that the tax here is not one on property as contemplated by the constitution but nothing more than an occupation tax which is distinguishable from a property tax and is not therefore governed by the constitutional provisions. Alaska Fish Salting & By-Products Co. v. Smith 255 U. S. 44; Alaska Pacific Fisheries v. Alaska 236 Fed. 52; Spreckels Sugar Refining Co. v. McClain 192 U. S. 397; Ohio Tax Cases, supra; Northern Pacific Railway Co. v. Gifford, 25 Ida. 196, 136 Pac. 1131.

[fol. 39] Another question has arisen which we should notice. It is whether the extraordinary session of the

Legislature was called as required by Section 9 of Article 4 of the State Constitution, it being asserted that there did not exist an extraordinary occasion justifying its calling, and therefore, the session was not constitutionally convened and the passage of the Act at that session was void. This provision of the Constitution provides that, "The Governor may, on extraordinary occasions, convene the Legislature by proclamation, stating the purposes for which he has convened it; but when so convened it shall have no power to legislate on any subjects other than those specified in the proclamation; * * *". It vests in the Governor power and discretion to convene the Legislature on extraordinary occasion in session which the framers of the Constitution have intrusted to the chief executive officer of the state alone. It would be an unprecedented proceeding for the Court to entertain a controversy wherein proof is offered to ascertain judicially whether an extraordinary occasion existed of sufficient gravity to authorize the Governor to convene the legislature in extra session. The character of the legislation to be considered by the legislature was by the Constitution left to the Governor, and a review of such discretionary act of the Governor should not be done by the Courts. In re Legislative Adjournment 18 R. I. 830, Farrelly v. Cole 56 Pac. 497, in re State Census 21 Pac. 477, Lasseter v. State 64 So. 847, Simpson v. Hill 263 Pac. 643.

The further claim is that the Act is so uncertain that it is incapable of enforcement and that its interpretation and enforcement depends on the arbitrary construction placed thereon by the Commissioner of Law Enforcement, as it is [fol. 40] pointed out that the terms of the Act will require that all electricity produced by the company engaged in the generation for sale or exchange shall be subject to the tax at the place of production, without deduction for the use by the producer of electricity for its own purposes or the losses which occur in the transmission which makes it uncertain to ascertain by measurement at the point of production and that a conflict appears in Sections 2 and 8 thereof, as Section 2 provides that in case the tax is not paid when due it shall bear interest at ten per cent per annum, and section 8 calls for a penalty for three times the amount of the unpaid tax. An analysis of the title and the body of the

Act does not show any ambiguity as to the basis of the measurement of the tax, for the title says, "levying a license tax of one-half mill per kilowatt hour on electricity and electrical energy generated, manufactured or produced in the State of Idaho for barter, sale or exchange," and Section 1 provides, that "every individual, firm, partnership, common law trust, corporation, association or other organization now engaged or hereafter to engage in the generation, manufacture or production of electricity and electrical energy in the State of Idaho, either through water power or by any other means for barter, sale, or exchange, and hereinafter referred to as the "producer", shall on or before the fifteenth day of each calendar month, beginning with the 15th day of July, 1931, render a statement to the Commissioner of Law Enforcement of the State of Idaho of all electricity and electrical energy generated, manufactured or produced by him or it in the State of Idaho, during the preceding calendar month and therewith pay a license tax of one-half (½) mill per kilowatt hour on all such electricity and electrical energy so generated, manufactured or produced, measured at the place of production * * *". Since Section 1 provides that those engaged in the genera-
[fol. 40½] tion of electricity "for barter, sale, or exchange * * *" pay a license tax of one-half (½) mill per kilowatt hour on all such electricity", it seems clear that it refers to energy generated for "barter, sale, or exchange", the same as referred to in the title. Nor does there appear to be a conflict in Sections 2 and 8, as Section 2 requires the payment of interest from the date the tax becomes due, that is, from the date of the delinquent tax which shall draw interest, while Section 8 provides that for a violation of any of the provisions of the Act or failure to pay the tax, the producer shall be liable, in addition to the interest, three times the amount of the unpaid tax. Section 8 only provides for an additional penalty to the payment of the interest, and that is a matter within the power of the legislature to impose. A statute should not be held void for uncertainty if any sensible or practical interpretation can be given. Alaska Pacific Fisheries v. Alaska (9th C. C. A.) 236 Fed. 70 affirmed, 242 U. S. 648, and the language in this Act "for barter, sale or exchange" of the electricity produced and "pay a license tax of one-half (½) mill per kilo-

watt hour on all such electricity and electrical energy so generated * * *", is definite in its relation to the energy by which the tax is to be measured.

We are next to inquire whether the Act runs counter to Section 16 Article 3 of the State Constitution as it is claimed that the Title and the Act contain two different subjects, namely, (a) the levying of a license tax for revenue purposes, and (b) the application of credits on the electric bills of certain consumers of electricity, and that the subject of the Act is not expressed in the Title, in that the Title purports to levy "a license of one-half mill per kilowatt [fol. 41] hour on electricity and electrical energy generated, manufactured or produced in the State of Idaho, for barter, sale or exchange", whereas the Act purports to levy upon the producer of electric energy for barter, sale or exchange, a tax of one-half mill on all kilowatt hours generated, manufactured or produced by him", and further, in the Title there is exempted from the tax "the electricity and electrical energy actually used for pumping water for irrigation purposes on lands in the State of Idaho", whereas the Act provides "that the full amount of such license tax which would have been due from such producers of electricity shall be so exempted". The privision of the Constitution applicable declares: "Every act shall embrace but one subject and matters properly connected therewith, which subject shall be expressed in the title; but if any subject shall be embraced in an act which shall not be expressed in the title, such act shall be void only as to so much thereof as shall not be embraced in the title".

The material parts of the Title and the Act are, "An Act levying a license tax * * * on electricity and electrical energy generated, manufactured or produced in the State of Idaho for barter, sale or exchange * * *". Section 1 of the Act provides "* * * each and every individual, firm, * * * engaged * * * in the generation, manufacture or production of electricity and electrical energy in the State of Idaho * * * for barter, sale or exchange, shall * * * pay a license tax of one-half (½) mill per kilowatt hour on all such electricity and electrical energy so generated, manufactured or produced, measured at the place of production," and further the Title provides: "Exempting from such license tax the electricity and elec-

trical energy actually used for pumping water for irrigation purposes on lands in the State of Idaho and providing that such exemptions shall accrue to the benefit of the consumer of such electricity and electrical energy." And [fol. 42] Section 5 provides: "All electricity and electrical energy used for pumping water for irrigation purposes to be used on lands in the State of Idaho is exempt from the provisions of this Act, except in cases where the water so pumped is sold or rented to such irrigated lands. Provided, the exemption here given shall accrue to the benefit of the consumer of such electricity or electrical energy."

It will be observed that Section 1 of the Act requires the producer to pay the tax on electricity and electrical energy generated, and that the only producer who is required to pay the tax is one who generates for barter, sale or exchange, and not where the plaintiff would be generating for its own use, and the language thus quoted relating to the exemption in the Title and Act are identical. Both exempt only electrical energy used for a specified purpose.

It is apparent that anyone reading the Title would be advised of the proposed legislation. It is clear and definite and sufficiently broad to cover the different provisions of the Act, so we are unable to give to the Title and the Act the interpretation urged by plaintiff, for both covers energy generated for barter, sale or exchange, and provides for the exemption, as the Title is not limited to energy actually used, and the Act to what is produced, for as already said both the Title and Act cover energy generated for barter, sale or exchange and the payment of the tax thereon. We think it clear that the Act only embraces one subject and matters properly connected therewith, as it relates to the same subject and is not foreign to the subject expressed in the Title. The Title refers to the energy taxed and to the exemption, the same as stated in the Act. They both provide for a license tax of one-half mill per kilowatt hour on [fol. 43] electricity generated, manufactured or produced for barter, sale or exchange, as well as an exemption of electricity used for pumping water for irrigation purposes. The exemption is germane to the provision for the tax, and may properly appear in the Act.

We find that the Supreme Court of Idaho in its interpretation of Section 16 of Act 3 of the Idaho Constitution, has held that if one can "reasonably gather the purpose and

object of the Act as found in the bill from its Title, "and put a person * * * on notice of the contents of the Act" (Turner v. Coffin, 9 Idaho, 338, 74 P. 962), that would be a compliance with the Constitutional requirements.

In a recent decision of the Supreme Court of the State in the case of State v. Pasta, 44 Idaho 671, 258 Pac. 1075, the Court said: "The object of the Title of an act is to give a general statement of the subject matter contained therein, and the act must not be so construed as to extend its effect beyond the limits fixed in the title. The title, however, must of necessity be brief; and a general statement will be held to be sufficient to include all the provisions having a reasonable connection with the subject matter mentioned in the title and which have a reasonable tendency to accomplish the purpose of the act."

And again the Supreme Court of the State has said: " 'If the provisions of a statute all relate directly or indirectly, to the same subject, have a natural connection, and are not foreign to the subject expressed in the title, it is permissible to unite them in the same act. The objections should be grave, and the conflict between the constitution and statute palpable, before the judiciary should disregard a legislative enactment upon the sole ground that it embraces more [fol. 44] than one subject,' * * * 'Provisions of an act may be numerous; but, however numerous, if they can be, by fair intendment, considered as falling within the subject matter of legislation, or necessary as ends and means to the attainment of the subject, the act will not conflict with the constitution.' * * * '* * * it was not intended to obstruct honest legislation, or to prevent the incorporation into a single act of the entire statutory law upon one general subject.' " Pioneer Irr. Dist. v. Bradley, 8 Ida. 310, 68 Pac. 295.

The further charge made by the plaintiff that the Commissioner will construe the Act to impose a tax based on all electricity generated or produced within the State of Idaho, and not solely upon such electricity for barter, sale or exchange and other charges as to the manner in which he will attempt to enforce the Act, are not matters which will warrant the Court in holding the Act invalid, but are to be considered in a proper proceeding, questioning the manner

of administering the Act by the Commissioner when enforcing it.

Finally we are thus brought to the consideration of the difficult problem as to whether in the practical operation of plaintiff's electrical system, the generation of electricity, is a continuous, inseparable transfer of energy constituting an unbroken chain from the state of its origin to that of its destination and interstate from beginning to end which will determine the question as to whether the legislative act when applied to plaintiff's operations infringes on the commerce clause of the constitution. Applicable to this issue of facts is the fundamental principle that where the production, transportation and delivery of the product is essentially local and not essentially national in character and the local interest is paramount and its production largely classified as essentially local in its nature, the enforcement of an excise tax in such a transaction does not place a direct [fol. 45] burden upon interstate commerce, and in reaching a conclusion in cases of this kind the question as to whether it actually burdens interstate commerce must be determined from the various circumstances. The essential test is whether the tax in fact burdens interstate commerce, even though it is laid upon a privilege which the state has power to tax, is illustrated by those cases which hold that where one is doing both local and interstate business the state can nevertheless impose a license tax for doing local business in such amount or manner if it appears that the production of the product is essentially local and indispensable with the carrying on of the business, and that the local interest is paramount. Neither the character of the commodity nor the preparation of it, or the intention of the owner to transport it out of the state puts it in interstate commerce for the movement of the commodity for another state must have actually, in good faith begun and be going on, and the character of the transportation depends upon all the circumstances looking to what the owner had done in preparation for the journey and in carrying it out. There is no doubt of the power of the state to impose a license tax upon electrical utility business within the state and to measure it by the standard of production within the state and whether it would deprive one of constitutional rights depends upon its practical operation and effect.

The Act here requires that the tax be computed according to the amount of electricity and electrical energy by kilowatt hours generated in the state and measured at the place of production irrespective of whether it be delivered or sold within or without the state. The point of time [fol. 46] when an article ceases to be under power of the state and comes under the protection of the constitution was considered by the Supreme Court in the case of Coe v. Errol, 116 U. S. 517, where it is said: "There must be a point of time when they (goods) cease to be governed exclusively by the domestic law and begin to be governed and protected by the national law of commercial relation, and that moment seems to us to be a legitimate one for this purpose, in which they commence their final movement for transportation from the State of their origin to that of their destination." There is a distinction between production and commerce as commerce succeeds production and is not a part of it. Production or manufacture is a transformation of raw material into a change of form for use while the functions of commerce consist in the purchasing, selling and exchanging of commodities and the transportation incidental thereto. Hammer v. Dagerhart et al., 247 U. S. 251. When in dealing with this subject Mr. Justice Day of the Supreme Court in the case of Pennsylvania Gas Co. v. Public Service Commission, 252 U. S. 23, gives an interesting discussion of the permission granted to the state in dealing with subjects which have relation to interstate commerce, and asserts:

"In dealing with interstate commerce it is not in some instances regarded as an infringement upon the authority delegated to Congress, to permit the States to pass laws indirectly affecting such commerce, when needed to protect or regulate matters of local interest. Such laws are operative until Congress acts under its superior authority by regulating the subject-matter for itself. In varying forms this subject has frequently been before this court. The previous cases were fully reviewed and deductions made therefrom in the Minnesota Rate Cases, 230 U. S. 352. The paramount authority of Congress over the regulation of interstate commerce was again asserted in those cases. It was nevertheless recognized that there existed in the states a permissible exercise of authority, which they might use [fol. 47] until Congress had taken possession of the field

of regulation. After stating the limitations upon state authority, of this subject, we said (p. 402): 'But within these limitations there necessarily remains to the States, until Congress acts, a wide range for the permissible exercise of power appropriated to their territorial jurisdiction although interstate commerce may be affected. It extends to those matters of a local nature as to which it is impossible to derive from the constitutional grant an intention that they should go uncontrolled pending Federal intervention. Thus, there are certain subjects having the most obvious and direct relation to interstate commerce, which nevertheless, with the acquiescence of Congress, have been controlled by state legislation from the foundation of the Government because of the necessity that they should not remain unregulated and that their regulation should be adapted to varying local exigencies; hence, the absence of regulation by Congress in such matters has not imported that there should be no restriction but rather that the States should continue to supply the needed rules until Congress should decide to supersede them.''

''The rates of gas companies transmitting gas in interstate commerce are not only regulated by Congress, but the Interstate Commerce Act expressly withholds the subject from federal control. C. 309, Sec, 7, 36 Stat. 539, 544.

''The thing which the State Commission has undertaken to regulate, while part of an interstate transmission, is local in its nature, and pertains to the furnishing of natural gas to local consumers within the city of Jamestown in the State of New York. The pipes which reach the customers served are supplied with gas directly from the main of the company which brings it into the State, nevertheless the service rendered is essentially local, and the sale of gas by the company to local consumers who are reached by the use of the streets of the city in which the pipes are laid, and [fol. 48] though which the gas is conducted to factories and residences as it is required for use. The service is similar to that of a local plant furnishing gas to consumers in a city.''

When we come to analyze the bill and the affidavits filed on the application for an interlocutory injunction from which we must look to determine whether there is a real dispute over material questions of fact, we find that there

is alleged in the bill that the plaintiff owns and operates an interconnected electrical power system consisting of generating stations, transmission and distribution lines and other electrical equipment located in the states of Idaho, Utah and Wyoming, whereby electrical energy is generated, transmitted, distributed and delivered for sale and exchange to its customers in each of said states. That the principal use of the electricity generated by it are at points in the states of Utah and Wyoming and its stations in Idaho were constructed solely for Utah and Wyoming service and that its local customers in Idaho have been connected to said stations to gain the economy and convenience thereof; that there is a continuous electric and electro magnetic belt between the windings in the generator and the windings in the consumer's motor; that the entire electric system is a device for transmitting the force (as the falling water) to and applying it at the point where it is to be utilized and the entire process is a continuous, inseparable transfer of energy from the water through the generators along the lines to the consumer's point of use in Utah and Wyoming; that the measurement of energy "upon which the tax sought to be imposed by the Act is based, is, and will be, a direct measure of the magnitude and duration of interstate commerce in electricity or electrical energy over said system, after said commerce has [fol. 49] commenced and during the course thereof." The affidavits filed by the defendant take an opposite view to that contended for by the plaintiff as to how and at what point the production of electrical energy begins and is completed by plaintiff's system, or that the same is operated in interstate commerce, so it is obvious from the allegations of the bill and what is set forth in the affidavit there is presented to the court at this stage of the proceedings a real controversy over material questions of fact which cannot be satisfactorily determined upon the presentation of affidavits and yet must be determined by the court before the constitutional validity of the Act can be determined. Ohio Oil Co. v. Conway, 279 U. S. 813; Love et al. v. Atchison T. & S. F. Ry. Co., 185 Fed. 321.

In view of what has been said and of the absence of a law of the state of any remedy enforcible by the plaintiff if the tax be paid and afterwards held invalid by the final decree, the motions of the defendant to dismiss and strike

are denied and the application of the plaintiff for an interlocutory injunction is granted upon the plaintiff giving an adequate bond whereby in the event the Act in question is adjudged valid by the final decree, the plaintiff and its surety will pay such amounts to satisfy the tax fixed by the Act with the interest as provided in the Act.

[fols.50-53] In United States District Court

[Title omitted]

Order Granting Application for Interlocutory Injunction—Filed Aug. 25, 1931

In harmony with memorandum opinion of the court filed herein on August 20th, 1931:

It is hereby ordered that the motions of the defendants to dismiss and strike are denied and the application of the plaintiff for an interlocutory injunction is granted upon the plaintiff giving an adequate bond as provided for in the order granting the interlocutory injunction filed in this cause.

Charles C. Cavanah, District Judge.

[File endorsement omitted.]

[fol. 54] [File endorsement omitted]

In United States District Court

[Title omitted]

Stipulation as to Right of Defendants to File Amended Answer—Filed Sept. 1, 1931

It is hereby stipulated by and between the parties to the above entitled cause, through their solicitors or attorneys of record, whose names are subscribed hereto, that in consideration of the taking of the deposition of Robert A. Millikan, a witness on behalf of plaintiff, pursuant to the stipulation of counsel herein filed and approved by the

Court, and which will require the absence of counsel from the state during a portion of the time granted to defendants by the stipulation of counsel and order of the Court herein, in which to file an answer to plaintiff's Bill of Complaint, that the issues of this cause may be made up by the filing of an answer by defendants before the taking of such deposition and that defendants shall have the right as of course to amend said answer in any particular at any time within ten days from the taking of said deposition.

In witness whereof the parties hereto have caused this stipulation to be signed by their solicitors or attorneys of record in their behalf this 1st day of September, 1931.

Hawley & Worthwine, Residence Boise, Idaho; Mer-
[fol. 55] rill & Merrill, Pocatello; Geo. R. Corey, Residence Salt Lake City, Utah; John F. MacLane, Residence New York City, N. Y., Attorneys and Solicitors for Plaintiff. Fred J. Babcock, Attorney General of the State of Idaho; Sidman I. Barber, Asst. Atty. Gen. of the State of Idaho; Maurice H. Greene, Asst. Atty. Gen. of the State of Idaho, Attorneys and Solicitors for Defendants.

Upon the reading and filing of the foregoing stipulation, it is ordered that the same be and hereby is approved.

Dated this 1st day of September, 1931.

Charles C. Cavanah, District Judge.

[fol. 56] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

AMENDED ANSWER—Filed September 22, 1931

Come now the defendants, Emmitt Pfost, Commissioner of Law Enforcement of the State of Idaho, and Fred J. Babcock, Attorney General of the State of Idaho, and for their amended answer to the Bill of Complaint of plaintiff herein filed with leave of court herein say:

1

Admit that plaintiff is a corporation, has complied with the laws of the State of Idaho, and is doing business in the states of Idaho, Utah and Wyoming, and that the business of plaintiff is that of generating and of transmitting and distributing electrical energy, as a public utility for barter, sale or exchange, as alleged in Paragraph I of said Bill of Complaint, except that defendants deny that plaintiff is or has been engaged in generating any electrical power or energy in interstate commerce between any states.

[fol. 57] 2

Defendants admit the allegations of Paragraph II of said Bill of Complaint.

3

Defendants admit that the matter in controversy herein, exclusive of interest and costs exceeds the sum of $3,000 and is between citizens of different states, but deny that the same arises under the Constitution of the United States.

4

Defendants admit the allegations of paragraph 4 of said Bill of Complaint.

5

Defendants admit that the defendant, Commissioner has prescribed, prepared and furnished forms of statements for tax returns under said tax act but denies that said Commissioner has in or by said forms construed or that he will otherwise construe said tax act to impose a tax on all electrical energy generated or produced within the State of Idaho, or upon any such energy other than that produced within said State for barter, sale or exchange, and deny that any electricity or electrical energy is generated or produced in interstate commerce.

6

Defendants deny that said Commissioner has notified plaintiff that it must pay a tax upon all electrical energy generated, manufactured or produced by it within the State

of Idaho, for any month, deny that said Commissioner intends to compute or ascertain or assess against plaintiff any taxes upon any electrical energy except that produced [fol. 58] and generated by plaintiff in the State of Idaho for barter, sale or exchange.

7

Defendants deny that said Commissioner will impose upon plaintiff any penalty upon a failure of plaintiff to pay a tax upon all electrical energy by it produced within the State of Idaho, or that defendants will sue to collect such taxes and penalties upon such failure of plaintiff, or otherwise except upon or in case of the failure of plaintiff to pay taxes due under the provisions of said act upon all electrical energy generated by plaintiff within the State of Idaho for barter, sale and exchange; deny that said tax act or the tax thereby levied and imposed or the penalties or injunctive process thereby provided for are unlawful or void or in violation of either the Constitution of the United States or the Constitution of the State of Idaho.

8

Defendants admit that plaintiff owns and operates an interconnected power system consisting of various generating stations locate- within the states of Idaho, Utah and Wyoming and transmission and distribution lines and other electrical equipment between said stations and points of use and of delivery to customers in said states, and that electrical energy generated at such stations is transmitted and delivered by means of such lines and other equipment to such customers, who include persons, firms, corporations and irrigation districts pumping water by electricity for irrigation purposes to be used on lands in the State of Idaho; but deny that any electrical energy is generated or [fol. 59] produced by any part of such system other than by such generating stations;

Admit that as a part of said system, plaintiff owns and operates certain hydro-electric stations in Idaho, among them said stations known as Soda, Grace, Cove and Oneida. These defendants are without information as to the amount of electrical energy by the generating stations of plaintiff in Idaho during 1930; and are not informed as to the

amount of such electrical energy sold by plaintiff in Idaho nor as to the amount used or consumed by it in transmission, distribution or sub-station losses pertaining to business in Idaho, nor as to the amount of such electrical energy consumed in station use by plaintiff in Idaho for plaintiff's own purposes and not for barter, sale or exchange; and being without such information denies each of such allegations of the Bill of Complaint and pray that plaintiff be required to make strict proof as to all such matters and facts. That defendants are without information as to the amount of electrical energy generated or produced by plaintiff at its stations in Idaho, during the year 1930, and transmitted by plaintiff to points without the State of Idaho, or as to the percentage of transmission or distribution losses sustained by plaintiff in transmission of electrical eneregy to points without the State of Idaho or as to the capacity of said Soda, Grace, Cove and Oneida stations or their connections with any lines or the points of use of electricity therefrom; or as to the local customer uses in Idaho from said stations, or the amount of energy generated in said [fol. 60] stations and delivered and sold to local customers, or as to the principal place of use of electricity transmitted by or over any lines; and being without such information deny each and every of such allegations of plaintiff's Bill of Complaint, and pray that plaintiff be required to make strict proof as to all of such matters and facts. Defendants deny that any electrical energy is generated by any of plaintiff's stations in Idaho in interstate commerce between any states and deny that plaintiff's said stations in Idaho were constructed solely or directly for the generation of electrical energy to be delivered to customers in Utah or Wyoming; and deny that the local customer uses from said stations in Idaho have been connected to said stations solely for the economy and service convenience permitted thereby but allege the truth and fact to be that the electrical energy generated by plaintiff at its said stations is transmitted, delivered and sold to such points and customers, in whatever localities, as may be reached by plaintiff an economic and practical commercial employment of its system (subject, of course, to regulation by the Public Utilities Commissions of the several states), and that such local customers in Idaho constitute a part of the market available to plaintiff.

9

Admit the allegations of Paragraph IX of plaintiff's Bill of Complaint, except that they deny that the annual license tax referred to in sub-paragraph (b) thereof, is imposed upon plaintiff for the right to do business in the State of Idaho and allege that the same is a corporate franchise tax [fol. 61] imposed upon plaintiff for the right to exist and do business as a corporate entity within the said state.

10

Defendants deny that under said tax act or in accordance with the interpretation placed thereon by the said Commissioner plaintiff would have been required for the year 1930 to pay a tax upon all electrical energy by it generated in the State of Idaho; that defendants are without information as to the total number of kilowatt hours of electrical energy generated and produced by plaintiff within the State of Idaho during the year of 1930 for barter, sale or exchange, nor as to the amount of such electrical energy which plaintiff will generate and produce during the year 1931 for barter, sale or exchange and therefore are without information as to the amount of taxes which would have been payable under said act during the year 1930, or which will become payable thereunder during the year 1931, and being without this information pray that plaintiff be required to make strict proof as to all such matters and facts.

11

Defendants deny that said tax act violates Article I, Section 8, Clause 3 of the Constitution of the United States in any respect, and particularly deny that any electricity or electrical energy is generated in Idaho by plaintiff on or by its interconnected interstate system or by any part thereof in interstate commerce and deny (a) that said tax act is laid upon any kilowatt hours of electrical energy [fol. 62] generated as property or that the same constitutes or imposes a tax upon property and deny that the same lays a burden upon any interstate commerce; (b) deny that said tax constitutes a burden upon any business of plaintiff or upon any interstate commerce or in any way interferes with or burdens any business of conducting interstate commerce.

Defendants deny that said tax act contains no provision or means for measuring or computing separately the amount of tax due under said act upon electrical energy generated in Idaho and used or consumed in said state and upon energy generated in Idaho and transmitted to points without said state, and deny that any part of the taxes imposed by said act are imposed upon or apply to any interstate commerce.

Deny that plaintiff cannot withdraw from or discontinue its intrastate business in Idaho.

12

Defendants admit that the terms "generation", "manufacture" and "production" as applied to energy in the electrical form are synonymous designations applied to one aspect of the process of transferring energy from some source in nature to some point where it may be usefully applied, to-wit: the process of transforming mechanical energy into electrical energy of new and different characteristics and uses; but deny that the same is merely one aspect of a process of transferring energy, or that the various electrical facilities used in said process are purely transferring devices, and deny that the entire electric system is a device for trasferring the force (as of falling [fol. 63] water) to, and applying it at, the point where it is to be utilized.

Defendants deny that the generation, transmission and use of electrical energy is continuous or simultaneous; admit that at the time of use of electrical energy by the consumer (except for the interposition and operation of transformers as hereinafter set forth) there is a continuous electrical and electro-magnetic path between the windings in the generator and the windings in the consumers' motor (or between the generator windings and the filament in an electrical lamp, or the electrodes in an electro-chemical cell), and admit that the manner of operation of plaintiff's generating stations is such that electrical energy is not generated for customers' use, except as called for by the customer, but deny that except as, and to the extent that, energy is called for and used at the final point of utilization, the electric generator neither receives from the water wheel shaft nor delivers to the electric transmission lines

any energy other than that necessary to hold the equipment under constant rotation and electric charge in instant readiness to serve, but allege that in the operation of plaintiff's generators an amount in excess of the aggregate of the amounts utilized by consumers or by plaintiff is generated, which excess is lost or consumed by the transmission line, sub-stations and transformers of plaintiff's system in the transmission and delivery of such energy, and in the production of the high tension current hereinafter referred to.

Defendants admit that the power, being transferred at any instant along the electric circuit existing between an electric generator and a receiving device, is calculable at [fol. 64] any point as to the power being transferred to such point, from the electrical pressure or voltage between wires and the magnitude and characteristics in the electric currents circulated in the wires, and that such power is commonly expressed in kilowatts; but deny that the amount of electrical energy generated by a generating station is measurable at any point on the circuit between such generating station and the points of utilization of such electrical energy, or at any place other than at such station.

Defendants admit that the "kilowatt-hour" is the usual unit for measuring energy in the electrical form, but deny that the same is a mathematical product of the power relation in the electric circuit between a generator and a receiving device measured in kilowatts and the duration of the time over which that relation is utilized, measured in hours, and allege that the same is the unit of measurement of the amount and volume of electrical energy produced at or delivered to a given point, i. e. the amount of energy which will accomplish, at such point a given amount of mechanical work, or produce a given amount of heat or light.

Defendants admit that in the case of plaintiff's system, and except for station uses, electrical energy is generated only when the combined demand of the customers of plaintiff by means of the operation of the mechanical devices hereinafter referred to, causes the turbine gates in the generating stations to open and thus permits the utilization of the energy of falling water exerted within the

[fol. 65] turbine to operate or drive the generator, and causes the generation or production of electrical energy thereby, but deny that said process of generation constitutes merely a transfer of the energy of the falling water through the electric generator and other parts of plaintiff's electric system to the customer; and further say that such response of production to demand is not inherent in generation, but is obtained by means of mechanical design and auxiliary controlling devices which obviate the necessity of manual control of such turbine gates and permit an automatic regulation of the amount of falling water which must be utilized to accomplish the generation of the required amount of electrical energy.

They admit that such process is practically continuous in its transfer of energy, but deny that the same is absolutely continuous or inseparable, as between the transfer of energy to the generator and the transformation of energy by the generator and transfer therefrom to the customer, or as between the transfer of energy from the generator to the transformer and from the transformer to the point of use.

Defendants admit that each customer's demands or use occurs just as and when the customer desires, and is affected by his act of switching on an electrical appliance or device, and admit that as such demand is made electricity is generated at plaintiff's stations, and that such response in order to the filling of such order is practically instantaneous; but deny that the only energy generated in response to such demand is specifically and solely for such demand and use, and allege the fact to be that an additional amount of electrical energy is required to be, and is, generated in order to permit the production at the transformer and transmission and delivery of the energy required by the customer to his devices and that the electrical current produced [fol. 66] at the generators is not the same current which is delivered to the consumer.

Defendants admit that the demands of plaintiff's various customers in Utah and Wyoming occur in various secondary transmission and distribution lines in said states, which demands are brought partially together through local facilities and consolidated at Terminal station near Salt Lake City, Utah, but deny that there is thus created a continuing combined demand on the Idaho generating stations, or that

such demand exists throughout the Idaho-Utah-Wyoming system. Admit that the incidence of this combined demand as between the several stations on the system, whether in Idaho or in Utah, is, under the control of plaintiff's Dispatcher at Terminal Station, under whose directions the different stations may be placed in readiness for service but allege that such service is in the production of electrical energy, and that under the direction of said dispatcher such switches are opened or closed in the tranmission network of plaintiff or other mechanical devices employed as will cause the generation of the amount of energy or power required by such stations as he may determine, but allege that the electrical current produced at such stations is not transmitted to Terminal Station, but is employed for the production of a new and different current in the transformers, which is transmitted to said Terminal Station.

Defendants deny that power or electricity generated at various Utah stations is transmitted to Terminal Station as the same current generated at such stations; admit that the current transmitted is or may be there com-ingled on common buses with the current transmitted from the transformers operated by power or electricity generated at the Idaho stations, and that between Terminal and the cus- [fol. 67] tomers' point of use, electricity or power can no longer be identified by its source, as in Idaho or Utah. Deny that the actual combined demand effective at Terminal station upon the 130,000 volt transmission line, automatically manifests itself on the various generators previously placed in readiness for service in the production of electrical energy without point of rest between generation and Terminal station. Admit that power or electricity transmitted from the Idaho stations to Utah over the 44,000 volt transmission lines extending from said Grace station, enters in Utah a similar system interconnected with generating stations in Utah, and is distributed thru substations, at which there is a similar loss of identity in Utah as between power generated in Idaho and in Utah.

Defendants deny that the "recording watt-hour meter or meters, or other suitable instrument for measuring the electricity or electric energy produced," which is required by said Tax Act to be maintained "at the point or points of production" on the plaintiff's interconnected Idaho-Utah-Wyoming system, will record, and must record, expressed

in terms of kilowatt hours, the mathematical product of the power relation in the electric circuit between the generators of said system in Idaho and the receiving devices in Utah and Wyoming (as their demands are combined at terminal station), measured in kilowatts, and the duration of time over which that relation is utilized, measured in hours, but allege that such meters or devices record the amount of energy generated at the point of production including, in [fol. 68] the measurement, the energy expended in the system to meet losses and necessary uses incident to the delivery of energy to such receiving devices. Defendants deny that the measurement recorded by such meters is or will be a direct, or any, measure of the magnitude or duration of interstate commerce in electricity or electrical energy over said system, either after said commerce has commenced or during the course thereof.

Defendants deny that the generation of electricity is not the production of a commodity or material thing, and deny that it is a part of the process of rendering a service; deny that no electricity can be commercially generated or produced except as an inseparable part of the service rendered, and deny that the kilowatt hour is the measure of a service, but allege that it is a measure of a commercial commodity.

Defendants allege that the process of generating, manufacturing or producing electrical energy consists essentially of the conversion or transmission of energy in another and different form or state into electrical energy with new and different physical characteristics and new and different uses. The electrical energy so produced may be transported with greater economy and facility than is possible with energy in a mechanical or other form or state; that its employment permits the manufacture and delivery of energy practically instantaneously with the need or requirement of the customer therefor; and that electrical energy is adapted to and may be employed and is commonly used in the operation or use of various mechanical devices or appliances which may not be operated by mechanical power, and that it permits the employment and use of various [fol. 69] devices and appliances with greater flexibility, facility and control than is possible with mechanical or other form of energy, or with an absence of the heat, odor, or noise accompanying the employment of mechanical or other form of energy.

The generation of electrical energy is accomplished by means of certain mechanical devices designed, constructed and operated by man for such purpose, and in such generation is given such definite characteristics, with reference to voltage or pressure, frequency, and its character as direct or alternating current as desired and as may be required by the needs of customers, or the character of the system. These characteristics are variable according to the character of the machinery employed.

Such generation, manufacture or production is accomplished by the utilization of power obtained from burning fuel, or of natural or created sources of water-power. The force of the water or steam pushing against the blades of the turbine wheel causes the turbine shaft to revolve and with it the rotating portion of the electric generator. As a result of the continuous motion of a system of electrical conductors across a magnetic field which is maintained in the generator by separate excitation of its field coils, electrical energy is made available at the stator or stationary part of the generator and consuming devices or appliances may be connected by wires thereto and the energy so generated used at such place.

Plaintiff generates electricity in the form of 60 cycle alternating current, so that the current reverses its direction of flow in the line between generator and the primary coil in the transformer, and in such coil, once every half [fol. 70] cycle. At the instant at which each change of direction is taking place there is a point of time at which there is no current.

In common operations and particularly in the operation of plaintiff's system and generating stations, the electrical energy so produced is conducted, by wires or other metal conductors, to the primary coil of a transformer in close proximity to the generating station. There is no other physical connection between the generator and any part of the transmission system or the devices employed in connection therewith than such wires leading to and from the stator to such primary coil. Said primary coil surrounds an iron core and the alternating current sets up a magnetic flux in such iron core. The transmission line is connected only to the high tension or secondary coil of such trans-

former which surrounds such iron core within the field of force of such magnetic flux, but is insulated from contact with either such primary coil or iron core. The primary coil is connected to a source of alternating voltage; ie., the generator, which tends to force current through the coil, first in one direction, then in the other. With such current flowing through such primary coil an electrical current is induced in such secondary coil and transmitted over the transmission system of plaintiff to points of use. The current so transmitted is a new current of new and different physical characteristics from the current forced through the primary coil by the generator; and which may be transmitted considerable distances with less loss of energy. The [fol. 71] amount of power that flows with any given current is proportioned to the voltage.

Similarly, the current transmitted is not in most instances the current delivered to the consumer, but by the interposition of other transformers a current of lower voltage than that transmitted (and of lower voltage than that produced at the generator) is induced in the transformer coils connected to the distribution lines and delivered to consumers.

Such electrical energy is a commercial commodity and is sold and delivered to customers without regard to the character of use to which it is or may be put by such customer, or the various appliances, devices or machines to be operated by him, and the vendor is without control over the character of use to which such electrical energy is put by the customer.

The amount of energy generated is controlled by generator design and the operation of auxiliary controlling devices and equipment. In both generation and sale the amount of energy produced or delivered is capable of exact and definite measurement.

Plaintiff's generating stations in Idaho are located at such points in Idaho as enable it to utilize the power in falling water taken from the streams and watersheds of Idaho, or utilized in such streams at a point where there is naturally or may be created by artificial means a waterfall of sufficient power to turn the generators, in lieu of power obtained from burning fuel. The water power and the [fol. 72] water so utilized by plaintiff is a natural and valuable resource of the State of Idaho and of use for the pro-

duction of hydro-electric power valuable and necessary to the development of the state; and such right of use is of great industrial and commercial value as a property right. Both the water and water power which is or may be made available for hydro-electric power within the State of Idaho, and particularly within the region in which plaintiff operates is limited in amount. Such right of use is not subjected to any ad valorem taxes by the state or any political subdivision, or to any tax except as may be imposed by the tax act herein referred to. The right to the use of such resources is had and enjoyed by plaintiff under permit and license of the state without payment of other than nominal fees and charges incident to the proceedings provided by law for the procurement of a license for such use. In the actual operations of plaintiff's system large volumes of water are annually diverted from the streams and lakes of Idaho into other channels than those in which the same would naturally and otherwise flow, and from which channels the same cannot be diverted for the irrigation or reclamation of lands in Idaho upon which the same could otherwise be applied. Idaho is an arid state, and said lands require the use of water, artificially applied, in order to the cultivation of said lands and the production of crops thereon. The *affect* of such diversion and use by plaintiff is to prevent the cultivation of large bodies of land which would thereby become of great value to the state and to render the same worthless. The character of the electric energy generated at said Idaho stations of plaintiff is such [fol. 73] that the same may be delivered and sold in barter, sale, or exchange, and used, at or in the vicinity of the plant, or at or to any other places in Idaho within a radius of two hundred miles or more, where customers and uses and markets may be found or developed therefore, or to demands from industries or uses which may hereafter be developed in such territory. As between different points of use its delivery is determined by the employment and operation of transmission lines, and not by the character or operation of any machinery at or in the generating station.

13

Defendants deny that said Tax Act violates the 14th Amendment of the Constitution of the United States or

that it denies to plaintiff the equal protection of laws in the business of generating or producing electrical energy in the State of Idaho, or that it permits or renders plaintiff's property liable to be taken without due process of law, and deny that any of the penalties fixed by said Act for failure to comply with the provisions thereof are so excessive as to intimidate or coerce or compel plaintiff or any person to comply with the provisions thereof without the freedom of resorting to the courts to test the validity of the provisions of said Act, or that such penalties are in any way excessive or in any way intimidate, coerce or compel plaintiff or any person to do anything.

14

Defendants deny that said Tax Act denies to plaintiff equal protection of the law or renders its property liable to [fol. 74] be taken without due process of law or that the said Act appropriates any money of plaintiff or requires the payment of any money of plaintiff for the benefit of any private individual.

15

(A) Defendants deny that the said tax act violates the Constitution of the State of Idaho in any manner or is in conflict with Article III, Section 16 of said Constitution, and particularly:

1. Deny that the title to said act or the act contain more than one subject, or contain any subject other than the levying of a license tax for the revenue purposes and matters intimate to and connected therewith, and allege that the provision for application of credits on the bills of certain customers of electricity is a provision for an exemption from said tax act, as referred to in such title, and no more;

2. Deny that the subject of said act is not expressed in the title and deny that said act purports to levy or levies any tax upon the producer of electrical energy based on or measured by all kilowatt hours generated, manufactured or produced by him, or upon other electrical energy than that produced for barter, sale or exchange, as referred to in such title;

3. Deny that the subject of said act is not expressed in the title thereto in that the quantity of electrical energy actually used for pumping water for irrigation purposes on lands in the State of Idaho is in anywise different from, or less than, the energy which would have been taxable at the place of production had not such energy been exempted under the provisions of said act.

[fol. 75] (B) Defendant deny that said act in exempting from tax the electrical energy used for pumping water for irrigation purposes to be used on lands in the State of Idaho, and providing that a sum equal to the tax that would otherwise be paid by the producer shall be credited on the power bill of the consumer:

(1) Violates Section 13 of Article I of the Constitution of Idaho, or in anywise deprives plaintiff of any property without due process of law;

(2) Violates Article VIII, Section 2, and Article VII, Section 2, of said Constitution or in anywise constitutes the levying of a tax for other than a public purpose, or constitutes the levying of a tax for the benefit of any individual;

(3) Imposes a tax for the benefit of any irrigation district or any municipal corporation, or in anywise violates Article VII, Section 6 of said Constitution.

(C) Defendants deny that the tax imposed by said act constitutes a second license tax imposed upon the plaintiff for the privilege of doing business within this state, as set forth in Subdivision b, Paragraph 9 of said Bill of Complaint, and allege that such corporate franchise tax as therein referred to is imposed upon plaintiff for the privilege of doing business as a corporate entity and without respect to the character of business engaged in or the conduct of any business, and that the tax imposed by the act here in question is an excise tax levied and imposed upon the production, generation or manufacture of electrical energy and solely related thereto, and without regard to the character of entity engaged in such generation and production; [fol. 76] and deny that said tax in anywise violated Article VII, Section 2 of said Constitution, or that such tax extends to any business done without the State of Idaho.

(D) Defendants deny that said act violates either Section 2 or Section 5 of Article VII of said Constitution. They deny that the same is a property tax or a tax upon a kilowatt hour as property or otherwise, or upon any property; but allege that the same is an excise tax, the amount whereof is based upon or measured by the number of kilowatt hours of electrical energy generated or produced by the producer in Idaho for barter, sale or exchange; and that the incidence thereof is upon the producer and not upon any property.

(E) Defendants deny that said Extraordinary Session of the Legislature was called in violation of the provisions of Section 9 of Article IV of said Constitution, or that no "extraordinary occasion" existed justifying the calling of said session, or that said session was called for the purpose of considering matters that had theretofore been considered at the Regular Session of the Legislature; and further allege that the act of calling such Extraordinary Session was a right and power vested by the Constitution of the State of Idaho in the discretion of the governor of said state, and that at the time of convening such session an extraordinary occasion or condition existed as to tax problems and the distribution of tax burdens within the State of Idaho.

[fol. 77] 16

Defendants deny that said act contains any uncertainties or ambiguities or that the provisions thereof cannot be certainly or definitely or equitably levied against plaintiff upon the basis of the number of kilowatt hours of electrical energy by it manufactured, generated or produced for barter, sale or exchange; deny that any taxes are levied on any kilowatt hours; and deny that:

(a) It cannot be determined from said act where a tax is to be levied on all kilowatt hours generated or produced in the State of Idaho, including those used in the taxpayers' own operations, but allege that such act provides for a tax to be measured by kilowatt hours of electrical energy produced for barter, sale or exchange.

(b) Defendants allege that the penalty of interest from due date at the rate of 10 per cent per annum, provided by

Section 2 of said act, is additive and supplemental to the penalty of three times the amount of the unpaid or delinquent tax provided by Section 8 of said act.

(c) Deny that the amounts provided by Section 5, of said act to be credited upon the power bills of consumers for irrigation pumping is in anywise different from or greater than the amounts exempted from tax because furnished to such irrigation pumping uses; or that any computation of such credits will include or be affected by any transmission losses.

And deny that any enforcement of said act will deprive plaintiff of any property without due process of law.

[fol. 78] 17

Defendants deny that said Tax Act is in anywise invalid, and deny that plaintiff will suffed irreparable injury or be subjected to a multiplicity of suits or be threatened with any heavy or severe penalty, and deny that plaintiff has no plain, adequate and complete remedy at law. Defendants deny that the penalties provided by said act are so unreasonable, burdensome or excessive that plaintiff could not safely refuse to pay the tax as same is demanded, or that any of such penalties are unreasonable, or burdensome or excessive.

Wherefore defendants pray judgment that the Bill of Complaint of plaintiff be dismissed, with costs to defendants.

Fred J. Babcock, Attorney General for Idaho; Sidman I. Barber, Assistant Attorney General; Maurice H. Greene, Assistant Attorney General, Solicitors for Defendants, Residing at Boise, Idaho.

[fol. 79] *Duly sworn to by Emmitt Pfost. Jurat omitted in printing.*

[fol. 80] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT, DISTRICT OF IDAHO, SOUTHERN DIVISION

No. 1621

UTAH POWER & LIGHT COMPANY, a Corporation, Plaintiff,

vs.

EMMITT PFOST, Commissioner of Law Enforcement of the State of Idaho, and Fred J. Babcock, Attorney General of the State of Idaho, Defendants

Hawley & Worthwine, of Boise, Idaho; Merrill & Merrill, of Pocatello, Idaho (Geo. R. Corey, of Salt Lake City, Utah, and John H. MacLane, of New York City, New York, of Counsel), for plaintiff, Utah Power & Light Company.

Fred J. Babcock, Attorney General of Idaho, and Sidman L. Barber and Maurice H. Greene, Assistants Attorney General, for defendants.

Before Sawtelle, Circuit Judge, and Webster and Cavanah, District Judges, as a Statutory Three-judge Court

MEMORANDUM OPINION—Filed December 30, 1931

CAVANAH, District Judge:

In the original opinion of the court rendered on August 20th, 1931, on the motions to dismiss and for an interlocutory injunction we considered and disposed of all questions presented, excepting the remaining one of fact as to whether the tax imposed by the Act was in its application to the plaintiff, a burden on interstate commerce, as there appeared from the bill and the affidavits filed a real controversy over material questions of fact which could not [fol. 81] have been satisfactorily determined by the bill and affidavits, so a Master was appointed to take the testimony and report the same without findings or recommendations of decree. The case is now again before the court upon the testimony for a final determination of the issue thus stated.

The purpose of the legislative Act in question is not in any manner to infringe on interstate commerce, but is to

require the payment of a license tax upon all electricity and electrical energy generated in the state of Idaho for barter, sale or exchange. It is limited to such electricity and electrical energy as is generated in the state and applies to the practical operations of those systems from which it can be determined the amount of electricity and electrical energy so generated as it requires the payment of ½ mill per kilowatt hour on all electricity and electrical energy so generated and produced in the state, measured at the place of production by the installation at the point of production by the producer of recording watt hour meters or other suitable instruments of a type to be approved by the Commissioner of Law Enforcement, although such electricity and electrical energy may in part enter its journey in interstate commerce. Under the Act the determination of the amount of electricity and electrical energy must be measured at the place of production and is based on the number of kilowatt hours.

Our cruic-al question, therefore is: Does the Act when applied to the practical operation of the plaintiff's electrical system infringe upon the commerce clause of the constitution? The principle applicable to this inquiry is as stated in our original opinion that where the production and delivery of the product is esesntially local in character and not essentially national and the local interest is paramount, the question as to whether it actually burdens interstate commerce must be determined from the various circumstances in each case. The movement of the com-
[fol. 82] modity for another state must have actually begun and is going on and the character of the transportation depends upon the circumstances looking to what the owner had done in preparation for the journey and in carrying it out. Turning then to the evidence and testing it by this rule a brief summary of it is indispensable to fully understand the nature of the plaintiff's operations. The manner of production and place of origin of the electricity and electrical energy generated by the plaintiff is testified to by some of the most noted engineers and physicists of the country, and, as usual among experts, there appears a difference of opinion relating to the practical and scientific view.

The weight of the evidence discloses that the plaintiff is engaged in the generation, transmission, delivery and sale

of electrical power and energy to its consumers, in the states of Idaho, Utah and Wyoming delivered at the point where the company's wires or apparatus are connected with those of the consumers, and the total energy generated by it at all of its Idaho stations for the year 1930 was 233,253,000 kilowatt hours, of which 199,968,000 kilowatt hours were generated at its Beaver River station in Idaho, and 33,285,000 kilowatt hours were generated at its other Idaho stations. Of the kilowatt hours so generated 6,978,000 kilowatt hours were its station use at Idaho stations and 24,046,000 kilowatt hours delivered to its Idaho consumers and its use at its division offices, and 198,502,000 kilowatt hours for transmission to Utah. The measured output of the Beaver River station in Idaho is 161,649,000 kilowatt hours. There are meters placed in the several stations showing the output in kilowatt hours and the amount of electrical power or energy delivered to the consumers is measured by meters at the consumers point of use. At the generating stations the amount of energy generated and the output to the transmission lines is measured as the plaintiff has determined that fact in kilowatt hours by meter [fol. 83] measurements from the generator to the transmission line. The essential apparatus interspersed in the system to accomplish the transfer of the energy from the falling water to the place of use are generators, transformers, and transmission lines. The generator is a device for converting mechanical energy into electrical energy and by which the energy drawn from the water is changed from one form to another and passed along. The transmission losses are dependent upon the transmission system—not upon the generating system and can be determined by the instal-ation of meters on the line of the system at various parts of it under given conditions. Energy for commercial purposes may be measured by meters placed outside of the generators, which is the first place at which energy transferred through the generator may be measured. These meters measure the energy flowing past the point at which the meter is connected, and the amount of the enrgy which reachs the transformer can be accurately measured at any point on the line and which is done as a commercial operation. The dispatcher at the stations by opening or closing of the different switches can direct the output of a certain station available to consumers over that

transmission net work. While there appear differences of opinion among the engineers, and scientists as to whether the generation of electrical energy can be determined at the place of production and before it reaches the point of use, yet we are impressed with th view expressed by those who have testified that it can be measured and the amount accurately determined by the instal-ation of meters or other proper instruments at the place of production, and especially is that true when we consider the testimony of Mr. Hale, the chief engineer of the plaintiff to the effect that in the operation of the system the plaintiff determines with accuracy its meter number of kilowatt hours of energy generated by it in Idaho at its various generating stations and before it starts in transmission on its journey to Utah [fol. 84] and Wyoming. This actual fact that the plaintiff is by its meters determining the number of kilowatt hours of the electrical energy at its generating stations in the State of Idaho, does without doubt, dispose of the contention made by the plaintiff that electrical energy cannot be measured and determined at the generator and before it is transmitted to the consumers. The witness, Rupp who qualified and ventured an opinion, says that the amount of electrical energy delivered can be measured at any point on the line of the system. If then the energy can be measured and determined at its place of production, being the generator, or anywhere on the line before it enters upon its journey in interstate commerce, it is quite clear that the production of the energy in the manner in which plaintiff is doing, is essentially local in character and not essentially national, although it is in part thereafter transmitted in interstate commerce. What the plaintiff is doing in the first instance is generating electrical energy from one of the natural resources of the state, the falling water, and the fact that thereafter it transmits and sells it both in and out of the state does not burden interstate commerce upon the principle recognized by the Supreme Court.

We must not forget the fact that the generator makes the energy available in the form as electrical energy but as generated it cannot be transmitted over the system. The transformer seems necessary in preparing it for its final journey through the induction of a current of higher voltage, as it is used to raise or lower the voltage with corresponding decreases or increases in current. So genera-

tion of energy preceeds transmission and use as it must first be converted into electrical energy, a process complete before the pulses of energy leave the generator in their flow to the transformer.

The tax provided for by the Act is not measured by the amount of electrical energy transmitted nor by the amount [fol. 85] sold or used, but solely by production, regardless of where delivered and sold, as the Act expressly provides that in the generation of electricity and electrical energy for the purposes mentioned in it the ones who do so shall pay the tax of ½ mill per kilowatt hour on the amount of such electricity and electrical energy so produced and not the amount used. We cannot yield our assent to the interpretation of the Act as given by counsel for the plaintiff when applied to the operations of plaintiff's system, that the amount of kilowatt hours generated can only be measured by meters at the points of use of customers in Utah. For as has been said the plaintiff has determined that fact by its meters at its generation stations in Idaho for it has given the exact number of kilowatt hours of energy generated at such stations and pleaded specific amounts of "sales in Idaho", "transmission, distribution and sub-station losses pending its business in Idaho", and "station use in Idaho for plaintiff's own purposes and not for barter, sale or exchange". Counsel for plaintiff have confused the word "production" of energy expressed in the Act with transmission, use and delivery, and their contention that the energy transmitted and delivered to Utah consumers for barter, sale or exchange must be measured there and determined on data assembled from readings taken in Utah, cannot be sustained when we remember that the Act relates only to energy "produced" in the state of Idaho, which can be determined under the testimony, at "places of production" and before it is transmitted to the foreign state. The process of generating the energy is complete within the State of Idaho. The tax is not one, when applied to kilowatt hours used by Utah consumers, upon the use because the amount of energy produced may be determined at the generator and before it reaches the Utah state line. It is nothing more than a tax upon an article produced within the state which thereafter is in part transmitted in commerce. The fact that the production is in

part designed for interstate commerce is immaterial, Heisler v. Thomas Colliery Company et al. 260 U. S. 245. [fol. 86] Nor is the fact that the production is in response to orders for delivery without the state controlling or, its production for interstate commerce itself such commerce. Oliver Iron Mining Co. v. Lord et al. 262 U. S. 172; United Mine Workers of America, et al. v. Coronado Coal Co. et al. 259 U. S. 344; United Leather Workers v. Herkert & Meisel Trunk Company et al., 265 U. S. 457.

To the non-technical mind the record here convinces us that there should be no difficulty in determining to a practical certainty how much electrical energy is generated at plaintiff's generating stations in Idaho, for as has been said, the plaintiff seems to be determining that fact with accuracy by the manner in which it is operating its system.

The thought advanced by the court in the case of South Carolina Power Co. v. South Carolina Tax Commission, recently decided and unreported, where the same question is as to the application of a similar statute to power companies claiming to be doing interstate business, impresses us as a further reason why the Act here when applied to the practical operations of plaintiff's system does not burden interstate commerce. The court in that case had before it the affidavit of Dr. Millikan, who has testified here in effect the same as what is set forth in his affidavit considered in that case, and the conclusion was there reached that the functions and operations of the transformer in the electrical processes are essential and are resorted to in order to a practical operation of the transmission lines, and that the energy generated in the generator could be determined before it was transmitted over the line into the foreign state.

In principle and the facts considered in the cases of Hope Natural Gas Co. v. Hall, et al. 274 U. S. 284; Oliver Iron Mining Co. v. Lord 262 U. S. 172; Heisler v. Thomas Colliery Co. 260 U. S. 245, would seem to give support in upholding the tax here.

In the case of Hope Gas Co. v. Hall et al., supra, the plaintiff, who was engaged in the production of natural gas in West Virginia, and the transportation of it through [fol. 87] pipe lines direct from its wells into the states of Pennsylvania and Ohio, where it was delivered and sold, sought an injunction against the enforcement of a tax act

of West Virginia, requiring it to pay a tax on the natural gas produced within the state and before it entered interstate commerce. It seems that most of the gas passed into interstate commerce by continuous movement from the wells. It was urged that the Act burdens interstate commerce, and also to enforce it would deprive plaintiff of property without due process of law, and deny equal protection of the laws. The highest court of West Virginia held that the Act was valid but required that the value of the gas be computed upon its value at the well and not otherwise. The Supreme Court affirmed the decision of the West Virginia court, and held that the ratio of the tax, being the entire production in the state regardless of the place of sale, or that deliveries may be made to points outside of the state, is not unconstitutional as respects gas transported to and sold in other states, since the highest court of West Virginia had held requiring the tax to be computed on the value of the gas at the well before it enters interstate commerce. The Act here requires that the tax be computed on the amount of electricity and electrical energy at the place of production within the State of Idaho.

And again the Supreme Court has said in Oliver Iron Mining Co. v. Lord et al., supra, the plaintiff was engaged in the business of producing iron ore from mines within the State of Minnesota and the legislature of that state enacted a law requiring it and all others who were engaged in such business to pay a tax equal to 6 per cent of the value of the ore produced in each year. The chief contention made by the plaintiff was that mining as conducted by it was so connected with interstate commerce that to tax it is to burden such commerce, and such contention rested upon the fact, that the demand or market within the state for iron ore [fol. 88] covered only a negligible percentage of what was mined, as practically all of their output was mined to fill contracts with consumers outside of the state and passed at once into the channels of interstate commerce. There was practically a continuity of movement from the time the ore was severed from its natural bed until it reached the consumer in the foreign state. The court reached the conclusion that the facts did not support plaintiff's contention, as mining was not interstate commerce, but, like manufacturing, is a local business subject to local regulation and

taxation, and said "The ore does not enter interstate commerce until after the mining is done, and the tax is imposed only in respect of the mining. No discrimination against interstate commerce is involved. The tax may indirectly and incidentally affect such commerce just as any taxation of railroad and telegraph lines does, but this is not a forbidden burden or interference." So here the production of the energy is not interstate commerce for it is produced and its production is completed and the amount thereof can be actually determined at the "place of production" within the state of Idaho and the tax reckoned according to the amount of it at the generator. American Manufacturing Company v. City of St. Louis 250 U. S. 459; Oliver Iron Mining Co. v. Lord, supra. Under the facts in this case the plaintiff should not treat the amount of energy reaching consumers outside of the state as the amount of the energy produced within the state, and before it enters interstate commerce.

The principle that the legislature of the state may require those who produce a commodity in the state for sale to pay a tax upon the amount produced and to keep a record thereof before the commodity starts on its journey in interstate commerce, has frequently been upheld in the light of the facts apparent in each case. The tax here is not laid on [fol. 89] the transportation of subjects of interstate commerce or on receipts derived therefrom, but merely on the production of electrical energy generated and determined within the state from one of the natural resources of the state. The Act does not, when applied to the manner in which the plaintiff operates its electrical system, burden interstate commerce, nor is it in conflict with any express enactments of Congress on the subject, nor contrary to any intention of Congress to be presumed from its silence.

Entertaining these views we believe there should be a decree for the defendants to the effect that the interlocutory injunction heretofore granted be dissolved and that the tax required by the Act with interest and costs of suit be paid by the plaintiff to the State of Idaho, less the penalty provided for in the Act during the pendency of the action.

[fol. 90] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

MOTION OF PLAINTIFF TO MAKE AND ENTER FINDINGS OF FACT AND CONCLUSIONS OF LAW—Filed Jan. 15, 1932

Comes now the plaintiff, Utah Power & Light Company, a corporation, and moves the above entitled Court to make and enter the following Findings of Fact and Conclusions of Law, to wit:

Findings of Fact

I

The first seven paragraphs of the Bill of Complaint are admitted to be true by the amended answer of the defendants and, therefore, found to be true by the Court, save and except it is denied by the defendants that the plaintiff is or has been engaged in generating any electrical power or energy in interstate commerce between states and that the controversy arises under the Constitution of the United States, and that the defendant Commissioner will construe the Tax Act, hereinafter referred to, to apply to all electricity produced by the plaintiff but only to such as is produced for barter, sale or exchange. With respect to the disputed allegations in said paragraphs the Court finds that the plaintiff, Utah Power & Light Company, a corporation, is engaged in the business of generating, transmitting and distributing electrical energy as a public utility within the States of Idaho, Utah and Wyoming; that the facts [fol. 91] relating to interstate commerce are as hereinafter recited. A controversy in this case arises under the Constitution of the United States. The defendants are charged with the duty of enforcing the provisions of that certain Tax Act passed by the Legislature of the State of Idaho in Extraordinary Session March 17, 1931, by the terms of which a tax of one-half mill per kilowatt hour is sought to be imposed upon the producer of electricity generated or produced within the State of Idaho for barter, sale or exchange. The defendants have prescribed forms and have

notified the plaintiff that it must pay such tax as provided for in said Act without regard to whether or not said electrical energy is consumed within or without the State of Idaho and irrespective of transmission uses, but not including such electrical energy as is used by the plaintiff in station uses.

II

The plaintiff owns and operates an interconnected electric power system consisting of generating stations, transmission and distribution lines, and other electrical equipment located in the States of Idaho, Utah and Wyoming, which system is operated as a unit, whereby energy in the electrical form is generated, transmitted, distributed and delivered, in barter, sale and exchange, to its customers in each of said states, including, but not limited to, persons, firms, corporations and irrigation districts, pumping water by electricity for irrigation purposes, to be used on lands in the State of Idaho and in interstate commerce between said States of Idaho, Utah and Wyoming. As part of said interconnected system, plaintiff owns and operates several hydro-electric stations located in the State of Idaho, consisting of certain stations on the Bear River known as Soda, Grace, Cove and Oneida.

[fol. 92] During the year 1930 there was generated or produced in and by that part of said system located in Idaho, in conjunction with said interconnected system, electricity measured through integrating watt hour recording meters in terms of 233,253,000 kilowatt hours, of which 199,968,000 kilowatt hours were generated at its Bear River stations in Idaho, and 33,285,000 kilowatt hours were generated at its other Idaho stations. Of the kilowatt hours so generated, 6,978,000 kilowatt hours were used for its station uses at Idaho stations, and 24,046,000 kilowatt hours were delivered to its Idaho consumers and its uses at its division offices, and 198,502,000 kilowatt hours for transmission to Utah. The measured output of the Bear River stations in Idaho to the 130,000 volt transmission lines were 161,649,000 kilowatt hours.

That the electricity, so generated and transmitted from Idaho to the States of Utah and Wyoming, subject to transmission and distribution losses or uses of approximately

twenty per cent, was sold by plaintiff in the States of Utah and Wyoming under contracts, theretofore entered into between said Company and its customers in said states, and the generation and transmission of said electricity to the customers of the plaintiff in the said States of Utah and Wyoming was necessary for the performance of said contracts with said customers.

The Soda, Grace, Cove and Oneida stations, located in Idaho, have a combined capacity of 95,500 kilowatts and are connected directly to three 130,000 volt transmission lines extending directly from said stations through Idaho to a station named "Wheelon" in Utah, and thence to a receiving and switching station named "Terminal" near Salt Lake City, Utah. There is no use of electricity from [fol. 93] said 130,000 volt lines in Idaho, the first use therefrom being at Wheelon, Utah, and the principal use of said electricity being at points in Utah and Wyoming after the same has passed through said Terminal station.

The local customer uses in Idaho from the Idaho stations, last above mentioned, are from separate outgoing lines segregated at the generating bus. Approximately two per cent. of the energy generated at said stations goes to serve local customers in Idaho. The local customers uses in Idaho have been connected to said stations merely to gain economy and service convenience, which, except for these major stations, would be impracticable. In addition to electricity transmitted over said 130,000 volt lines, some electricity from said stations also reaches Utah over 44,000 volt lines from the Grace station.

The operations described for the year 1930 are similar to and descriptive of plaintiff's operations as the same are now practiced during 1931, and plaintiff's operations in the future will be substantially the same and in substantially the same proportions as between intrastate and interstate commerce.

III

The Court finds that the plaintiff's "Bear River System" was constructed primarily for the purpose of generating electricity for use in the State of Utah, and that since its construction it has been used almost solely for the purpose of generating electricity which passes without interruption from the Idaho plants on the Bear River to the consumers in Utah and Wyoming and substantially all of

the patrons of the plaintiff who use electricity from these plants do so under contracts with the plaintiff, which contracts are made and fulfilled outside the State of Idaho.

[fol. 94]

IV

Upon the above described property, and in connection with its business aforesaid, plaintiff has been and will continue to be required to pay annually, taxes imposed under the general tax laws of Idaho, as follows:

(a) A general property tax levied annually upon all property, real and personal, of the plaintiff, situated within the State of Idaho, in proportion to its value, in common with all other property in the State not exempt from taxation. Plaintiff has paid such general property tax upon its property in Idaho annually; this tax for the year 1930 amounted to $412,090.07, and was based upon an assessed valuation of $11,088,009.00; and a like assessment will be made and a like tax levied and paid for the calendar year 1931, and in subsequent years.

(b) An annual license tax for the right to do business in Idaho as a corporation based upon plaintiff's authorized capital stock, which tax plaintiff has paid annually since its incorporation and qualification to do business in Idaho.

(c) An income tax, effective July 1, 1931, levied and collected upon the net income of plaintiff in Idaho.

None of the foregoing tax laws under which the taxes enumerated in this paragraph are levied and assessed against the plaintiff, have been repealed and all remain in full force and effect.

V

In addition to the taxes aforesaid levied against and collected from the plaintiff, another tax is sought to be imposed and levied against the plaintiff by virtue of said Tax Act. Plaintiff, in the year 1930, generated or produced within that part of its interconnected system located in Idaho, electricity measured in terms of 233,253,000 kilo-

[fol. 95] watt hours, and for the year 1931 and thereafter will generate or produce approximately a like amount of electricity in said State upon said system. Under said Tax Act and in accordance with the interpretation placed

thereon by the Commissioner, plaintiff would have paid for the year 1930, had said Tax Act been then effective, an amount in excess of $100,000.00. The gross business of the plaintiff in Idaho for the year 1930, from the production and sale of electricity within said State, amounted to approximately $735,000.00, and will continue in approximately that amount annually hereafter.

VI

The tax imposed by said Tax Act is a license tax upon the producer and no provision is made in said Tax Act for measuring or computing separately the amount of the tax as applied to such electricity as might be used in Idaho as distinguished from that used in Utah and Wyoming. The plaintiff cannot withdraw from or discontinue its Idaho business.

VII

The terms "generation", "manufacture" and "production" as applied to energy in the electrical form are merely synonymous designations applied to one aspect of the process of transferring energy from some source in nature (such as falling water) to some point where it may be usefully applied. The various electrical facilities used in said process are purely transferring devices, and the entire combined process—electric, magnetic and mechanical—is integral, continuous and essentially simultaneous, as electricity travels with the speed of light—one hundred and eighty-six thousand miles per second of time.

[fol. 96]

VIII

There is a continuous electrical and electro-magnetic path between the windings in the generator and the windings in the consumer's motor (or between the generator windings and the filament in an electric lamp or the electrodes in an electro-chemical cell). The entire electric system is a device for transferring the force (as of falling water) to, and applying it at, the point where it is to be utilized.

IX

The Court further finds that in the case of the plaintiff's system "electricity and electrical energy", described in the

Tax Act, is "generated, manufactured or produced" only if, as and when the combined demand of its customers in Utah and Wyoming, causes the turbine gates of the Idaho generating stations to open, thus permitting the energy of the falling water exerted within the turbine to be instantly transferred through the electric generator and other parts of the interstate electric system to the customers motors, lights or other equipment. Each customer's demand occurs just as and when the customer desires, and is effected by his act of switching on lights, motors, ranges and other electric appliances. As the demand is made, the electricity demanded is instantly, and as an immediate and direct result of said demand, generated at plaintiff's said stations specifically and solely for, and in response to, that demand and use. The demands of the plaintiff's various customers in Utah and Wyoming occur on various secondary transmission and distribution lines in said States, which demands are brought partially together through local facilities and [fol. 97] completely consolidated at Terminal Station, near Salt Lake City, Utah. There is thus created a continuing combined demand on the Idaho generating stations which exists throughout the Utah-Idaho-Wyoming system. The incidents of this combined demand as between the several stations on the system, whether in Idaho or in Utah, is, within the limits of the effective capacity of the several stations, under the control of plaintiff's dispatcher at Terminal Station, under whose directions the different stations may be placed in readiness for service. Power or electricity generated at the various Utah stations is likewise transmitted to Terminal Station and there commingled on common buses with power or electricity generated at the Idaho stations. Between Terminal and the customer's points of use, electricity or power can no longer be identified by its source, as in Utah or Idaho. The actual combined demand effective at Terminal Station upon the 130,000 volt transmission line, automatically manifests itself on the various generators previously placed in readiness for service, in the manner hereinbefore described, without point of rest between generation and Terminal Station. Similarly, power or electricity transmitted from the Idaho Stations to Utah over the 44,000 volt transmission lines extending from Grace Station enters in Utah a similar system

interconnected with generating stations in Utah, and is distributed through substations to which there is a similar loss of identity in Utah as between power generated in Idaho and in Utah.

X

The entire process of generation, transmission and use of electrical energy on the plaintiff's system is a continuous, inseparable transfer of energy from the falling water, through the generators, transformers, along the transmis- [fol. 98] sion lines, to the customers' points of use in Utah and Wyoming the transfer of which electrical energy is at a rate of speed of approximately one hundred and eighty-six thousand miles per second of time.

XI

There is an absolute interdependence of the consuming devices upon the generator and there can be no generation of electrical energy upon the plaintiff's system except as and to the extent that such energy is called for and used at the final point of utilization other than that absolutely necessary to hold the electric generator under constant rotation and electric charge in instant readiness to serve.

XII

The difference in amount of electricity generated and that actually used by the consumer constitutes line uses and is necessary and essential in the process of generating, transmitting and using electricity.

XIII

The Court finds that electrical energy or "kilowatt hours" produced or generated upon the plaintiff's system and in the plaintiff's generators cannot be stored or reservoired or detained, but is used by the consumer instantly with its generation. There is no point between the generation and the use of said electrical energy where the same is detained or brought to rest.

XIV

The power being transferred at any instant along the electric circuit existing between an electric generator at one place and a receiving device at another place is calculable at

any point in the circuit from the electrical pressure or volt-
[fol. 99] age between wires and the magnitude and characteristics of the electric current circulating in the wires, and is commonly expressed in kilowatts.

XV

The "kilowatt hour", the usual unit for measuring energy in the electrical form, is a mathematical product of the power relation in the electric circuit between a generating and receiving device, measured in kilowatts, and the duration of time over which that relation is utilized, measured in hours.

XVI

The "recording watt hour meter or meters, or other suitable instrument for measuring the electricity or electrical energy produced," which is required by said Tax Act to be maintained "at the point or points of production" on the plaintiff's interconnected Idaho-Utah-Wyoming system, will record, and must record, expressed in terms of kilowatt hours, the mathematical product of the power relation in the electric circuit between the generators of said system in Idaho and the receiving devices in Utah and Wyoming (as their demands are combined at Terminal Station), measured in kilowatts, and the duration of time over which that relation is utilized, measured in hours, including, in the measurement, the energy expended in the system, to meet losses and other necessary uses incident to the delivery of energy to such receiving devices.

XVII

The measurement of electrical energy upon which the tax is sought to be imposed by said Tax Act is, and will be, a direct measure of the magnitude and duration of interstate commerce in electrical energy over said system, after said commerce has commenced and during the course thereof.

[fol. 100]

XVIII

The generation of electricity is not the production of a commodity or material thing; it is a part of the process of rendering a service, and no electricity can be commercially generated or produced except as an inseparable part of the

service rendered. Likewise the "kilowatt hour" is the measure of such service and not a measure or unit of material things.

XIX

The Court further finds that there is a marked distinction between electric current and electrical energy or power; that electric current is the carrier for electric power or energy; electric current is not used or consumed by the consumer but returns again to the generator, leaving behind the electric energy or power which is used or consumed by the consumer. Electric current is never bought or sold; it is the electrical energy which is purchased by the consumer. Electric current is measured in amperes while electric energy is measured in kilowatt hours—two distinct quantities, not convertible into each other, nor expressible in terms of each other.

XX

The function of a transformer in a hydro-electric system like that of the plaintiff is to transform current and voltage such as to give it higher or lower pressure. It does not in any respect affect or change the power or electric energy. Its use is purely an economic one. It plays a role similar to that of a set of reduction gears and affects solely the electric current, while the same electrical energy or power which comes from the generator passes through the transformer without change in its physical or other characteristics and that energy which is purchased and used by the consumer is the same energy which leaves the generator [fol. 101] and passes through the transformer, along the transmission lines to the consumer's device.

XXI

The electrical energy, which is required to be measured by said Tax Act in terms of kilowatt hours, is precisely the same energy whether it is measured after it leaves the generator and before it enters the transformer or measured at any other place along the transmission line between the generator and consumer's device and said measurement cannot be made at any point except as and when the electrical energy is in motion and passing to its destination.

XXII

The Court further finds that the generation, transmission and use of electrical energy is an integral inseparable process and this process is inseparably connected with the fulfillment of contracts for service between the plaintiff and its various customers in Utah, Wyoming and Idaho; that the Tax Act considered in this case cannot operate as against the plaintiff except that it burdens the commerce in electrical energy between the States of Utah, Idaho and Wyoming.

XXIII

With respect to the issues formed by the allegations of Paragraph 13 of the bill of complaint and the amended answer of the defendants thereto, the Court finds that the penalties prescribed in said Tax Act are not necessarily involved in this suit as no attempt is now being made to enforce said penalties, and the Court further finds that no penalties will be imposed against the plaintiff under said Tax Act for the period pending the final determination of this cause either here or upon appeal and that the provisions of said Tax Act relating to penalties are separable from the other provisions of the Act and, if held to be unconstitutional, would not affect the validity of the Act as a whole or any provision not specifically connected with said penalties and, therefore, in advance of any attempt to enforce such penalties, the Court declines to pass upon the validity thereof.

[fol. 102]

XXIV

The Court finds that Section 5 of said Tax Act compels an appropriation and payment of money of the plaintiff for the sole and exclusive benefit of private individuals and corporations, to wit: those using electrical energy for pumping water for irrigation purposes, without compensation to the plaintiff therefor. The Court further finds that the effect of the Act is different according as Section 5 is held to be valid or invalid. Section 5 is, therefore, inseparable from the balance of the Act and the Court cannot determine from the Act whether or not it would have been passed by the Legislature had said Section 5 not been included therein.

XXV

With respect to the issues raised by Paragraph 15 of the Bill of Complaint and the Amended Answer of the defendants thereto, the Court finds as follows:

A

1. Both the Title and the Act contain two subjects, that is (a) the levying of a license tax for revenue purposes; and (b) the application of credits on the electric bills of certain consumers of electricity.

2. The subject of the Act is not expressed in the Title in that the Title purports to levy "a license tax of one-half mill per kilowatt hour on electricity and electrical energy generated, manufactured or produced in the State of Idaho for barter, sale or exchange", whereas the Act purports to levy upon the producer of electrical energy for barter, sale or exchange a tax of one-half mill on all kilowatt hours generated, manufactured or produced by him. The plaintiff has generated and will continue to generate electrical energy substantially in excess of that generated for barter, sale or exchange and the tax sought to be levied in the Act is, therefore, substantially different and greater than that expressed in the title.

3. The subject of the Act is not expressed in the Title [fol. 103] in that the Title provides that there shall be exempted from the tax "the electricity and electrical energy actually used for pumping water for irrigation purposes on lands in the State of Idaho", whereas the Act provides "that the full amount of such license tax which would have been due from the producer of electricity" shall be so exempt. These quantities are entirely different in that the energy "actually used" is substantially less than the energy taxable at the "place of production".

4. The title of the Act is deceptive in that the subject matter of the Act is not expressed in the Title.

B

The Act, in exempting from the Tax the electricity and electrical energy "used for pumping water for irrigation purposes to be used on lands in the State of Idaho" and

providing that a sum equal to the tax that would otherwise be paid by the producer shall be paid to the consumer, constitutes the levying of a tax for other than a public purpose, to wit: a tax for the benefit of an individual and furthermore imposes a tax for the benefit of municipal corporations, to wit: irrigation districts which pump water by means of electricity supplied by the plaintiff for irrigation purposes.

C

The said tax is a license tax and constitutes a second license tax imposed in the same year for the same purpose in that the plaintiff has heretofore been required to pay a license tax as provided by statutes of the State of Idaho heretofore enacted by said State, the payment of which tax is conditioned upon plaintiff's right to do business in the State as a corporation.

D

The tax imposed, or attempted to be imposed by said Tax Act, is a license tax.

[fol. 104]

E

The Extraordinary Session of the Legislature of the State of Idaho, at which said Act was passed, convened pursuant to a call made prior to the adjournment of the regular session of the Legislature and for the purpose of considering matters that had theretofore been considered at the regular session of said Legislature; that said regular session had made all appropriations necessary for the ensuing biennium and had levied a general ad valorem tax sufficient to meet all expenses of the Government of said State for said biennium. No extraordinary occasion existed justifying the calling of the Extraordinary Session of the Legislature of said State.

XXVI

The said Tax Act is uncertain and ambiguous in the particulars alleged in Paragraph 16 of the Bill of Complaint, and particularly:

(a) It cannot be determined from said Act whether a tax is to be levied on all kilowatt hours generated or produced

within the State of Idaho, including those used in the taxpayer's own operations or on such kilowatt hours as are generated or produced in the State of Idaho for barter, sale or exchange.

(b) Section 2 of said Tax Act provides that "taxes not paid on the due date shall become delinquent and shall bear interest from said due date at the rate of ten per cent per annum", while Section 8 of said Tax Act provides that any producer "who shall fail to pay the license tax herein provided for, or any part thereof, when due, shall be liable for three times the amount of the unpaid or delinquent tax".

[fol. 105] (c) Section 5 of said Act provides that the "full amount of such license tax which would have been due from such producers of electricity or electrical energy, if such exemptions (irrigation pumping)) had not been made, shall be credited annually for the year in which the exceptions are made on the power bill of the consumer by the producer of such electricity and electrical energy furnishing such power"; that the electrical energy supplied the irrigation consumer is not measured at the point of production where the Tax Act requires the same to be measured, but is measured at the point of consumption; that the measurements at the two places are entirely different and there is no method provided in said Tax Act for computing the exemption upon the amount of electricity measured at the points of use and no provision is made for determining the relation between the points of use and production. An enforcement of said Tax Act by the defendants will depend upon an arbitrary construction thereof.

XXVII

The Court further finds that the Tax Act is levied upon the producer of electrical energy measured by that energy produced for barter, sale or exchange exclusive of energy used by the plaintiff for its various uses, including station uses, and also exclusive of transmission or line uses. The measure of said tax is that energy actually sold and delivered to the customer or consumer for compensation.

XXVIII

The defendants, Commissioner and Attorney General, propose and have threatened to enforce, and will endeavor

to enforce, through appropriate action, the fines and penalties prescribed in said Tax Act; that such would result [fol. 106] in a multiplicity of suits in that a suit might be instituted for the collection of taxes and penalties each month that plaintiff failed to pay the tax; that the penalties are so unreasonable, burdensome and excessive that plaintiff could not safely refuse to pay the tax as the same is demanded; that there is no provision of the statutes of Idaho under which plaintiff could pay the tax under protest and recover back the amount so paid, but any payment so made would be credited to the general fund of the State and its reimbursement could not be effected except through a subsequent Act of the Legislature.

From the foregoing facts plaintiff moves the Court to make the following

Conclusions of Law

I

That the plaintiff is entitled to maintain this suit for injunctive relief to test the validity of said Tax Act.

II

That said Tax Act violates the Fourteenth Amendment of the Constitution of the United States in that Section 5 of said Act compels the appropriation and payment of money by the plaintiff for the sole and exclusive benefit of private individuals without compensation to the plaintiff therefor.

III

That said Section 5 cannot be eliminated from said Tax Act without destroying the entire Act.

IV

That said Tax Act violates Article III, Section 16, of the Constitution of the State of Idaho, which provides that every Act shall embrace but one subject and matters [fol. 107] properly connected therewith, which subject shall be expressed in the title in that:

(a) Both title and act contain two subjects, viz., (1) levying a tax for revenue purposes and (2) the application

of credits on the electric bills of certain consumers of electricity.

(b) The subject of the Act is not expressed in the title in that the title purports to levy a tax on electricity generated for barter, sale or exchange, whereas, the Act purports to levy the tax upon the producer of electricity for barter, sale or exchange on all electricity generated by such producer.

(c) The subject of the Act is not expressed in the title in that the title exempts from the tax electrical energy actually used for pumping water for irrigation purposes on lands in the State of Idaho, whereas, the Act provides that the full amount of such tax which would have been due from the producer shall be exempt.

V

That said Tax Act, in exempting therefrom the tax on electrical energy "used for pumping water for irrigation purposes to be used on land in the State of Idaho" and providing that a sum equal to the tax that would otherwise be paid by the producer shall be paid to the consumer, is void because it violates the following provisions of the Constitution of the State of Idaho, to-wit:

(a) Section 13 of Article I of said Constitution which provides that no person shall be deprived of property without due process of law.

(b) It constitutes the levying of a tax for other than a public purpose, to wit: for the benefit of an individual in violation of Article VIII, Section 2, and Article VII, Section 2, of said Constitution.

(c) It imposes a tax for the benefit of municipal corpo- [fol. 108] rations, to wit: irrigation districts which pump water by means of electricity supplied by the plaintiff for irrigation purposes, in violation of Article VII, Section 6, of said Constitution, which provides that the legislature shall not impose taxes for the purposes of municipal corporations.

VI

That said Tax Act constitutes a violation of Section 2 of Article VII of the Constitution of the State of Idaho, in

that it imposes a double license tax and fails to provide for the levying of the tax according to valuation; the tax violates Section 5 of Article VII of the Constitution of the State of Idaho in that it fails to levy a uniform tax on same class of subjects within the territorial limits of said State.

VII

That said Tax Act violates the provisions of Section 9 of Article IV of the Constitution of the State of Idaho in that at the time the Extraordinary Session of the Legislature was called no extraordinary occasion existed for calling said session.

VIII

That said Tax Act is further void for the uncertainties and ambiguities recited in these Findings, which cannot be harmonized and construed together.

IX

That said Tax Act violates Clause 3, Section 8, Article I, of the Constitution of the United States, in that it imposes a direct burden upon the interstate commerce conducted and engaged in by the plaintiff in the generation, transmission, sale and use of electrical energy.

[fol. 109]

X

That it is impossible to segregate the tax attempted to be imposed by said Tax Act and measured by the intrastate business done by the plaintiff from that measured by the interstate business done by said plaintiff; that said Tax Act, in attempting to impose a tax upon interstate business, is void as to such business, and, because of its inseparability from intrastate business, is void in its entirety as the same applies to this plaintiff.

XI

That the plaintiff is entitled to a decree declaring said Tax Act unconstitutional and void, and for a permanent injunction perpetually restraining the defendants from enforcing the same.

Respectfully submitted.

Hawley & Worthwine, Merrill & Merrill, John F. MacLane, Geo. R. Corey, Solicitors for Plaintiff.

[fol. 110] IN UNITED STATES DISTRICT COURT

ORDER DENYING MOTION OF PLAINTIFF FOR FINDINGS OF FACT AND CONCLUSIONS OF LAW—Filed Feb. 13, 1932

Plaintiff's Motion to make and enter the foregoing Findings numbered 1 to 28 and the foregoing Conclusions of Law is hereby denied.

Dated this 30th day of January, 1932.

W. H. Sawtelle, J. Stanley Webster, Charles C. Cavanah, Judges.

[File endorsement omitted.]

[fol. 111] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

EXCEPTIONS OF PLAINTIFF TO REFUSAL OF COURT TO MAKE AND ENTER FINDINGS OF FACT AND CONCLUSIONS OF LAW PROPOSED BY PLAINTIFF AND EXCEPTIONS TO FINDINGS AND CONCLUSIONS MADE AND ENTERED AND DECREE THEREON—Filed Feb. 8, 1932

Comes now the plaintiff and excepts to the ruling of the Court denying plaintiff's Motion to make and enter those certain Findings of Fact Numbered I to XXVIII, inclusive, and to the Court's refusal to make Conclusions of Law Numbered I to XI, inclusive, which Findings of Fact and Conclusions of Law are set out specifically and in detail in the motion of plaintiff to make and enter findings of fact and conclusions of law filed in the above entitled cause on the — day of January, 1932. Plaintiff further excepts to Findings of Fact Numbered I to VI, inclusive, and to Conclusions of Law Numbered I to XII, inclusive, made, signed and entered in the above entitled cause, and to the Decree entered herein and thereon dissolving the Interlocutory Injunction heretofore granted the plaintiff and ordering the payment of the tax required by the Tax Act described in the Bill of Complaint. These exceptions are [fols. 112-122] taken generally and separately to the re-

fusal of the Court to make the Findings and Conclusions tendered by the plaintiff and to those made and entered by the Court upon the grounds that the law affecting and controlling the matters alleged in the plaintiff's Bill of Complaint and the issues made in this cause, and the evidence introduced in this action, and particularly such evidence touching the process of the generation, transmission and use of electrical energy upon the plaintiff's system and the manner and method of the plaintiff's operations in the generation, transmission and sale of electrical energy in and between the States of Idaho, Utah and Wyoming, require the Findings of Fact and Conclusions of Law proposed by the plaintiff and do not support the Findings of Fact and Conclusions of Law and Decree signed and entered by the Court.

Without waiving the foregoing general Exceptions, but expressly relying thereon, the plaintiff takes the following special and particular Exceptions to the refusal of the Court to make and enter:

* * * * * * *

[fol. 123]

XXV

Plaintiff excepts to Finding No. II to the effect that "it is a matter of speculation as to where markets will exist in the future for the electrical energy generated by the plaintiff at its said Idaho stations".

XXVI

Plaintiff excepts to Finding No. V to the effect that "electrical energy so generated is energy with new and different physical characteristics and new and different uses than energy in other forms"; and that the "electrical energy so produced is in the process of generation given definite characteristics with reference to voltage, frequency and its character as direct or alternating current as desired [fol. 124] and as required by the needs of the customers or the character of the system" and that "these characteristics are variable according to the character of the machinery employed"; that "the process of conversion of energy in the electrical form is completed at the generator

and before the pulses of energy leave the generator in their flow to the station bus or transformer"; and that "the amount of electrical energy so generated and measured is substantially greater than the amount which plaintiff may deliver to Utah or any distant point by reason of losses occurring in the subsequent process of transforming the flow of energy to a different current and voltage in order to transmission, and in or from the transmission line"; that "the kilowatt-hour is a unit of measurement of a definite physical entity, and of a commercial commodity produced by the plaintiff for transmission, delivery and sale to its customers and/or purchased by the plaintiff from other producers for such transmission, delivery and sale by the plaintiff"; and that "it is not the measurement of a period of time nor of service."

Plaintiff further specifically excepts to that portion of Finding No. V. to the effect that "the transformers are interposed to produce a different current and higher voltage" and that "such changes in the physical characteristics of the flow of energy from the generator and the production of a separate current are required in order to and in preparation for transmission and that the same are sub- [fol. 125] stantial in character; in that electrical devices or appliances designed to function with the current and voltage at which plaintiff generates would not function with the current and voltage at which the energy flows from the transformer"; and "similarly, the current and voltage transmitted is not in most instances delivered to the consumer but by the interposition of other transformers and separate current of lower voltage than that transmitted (and of lower voltage than that produced at the generator) is induced in the transformer coils connected to the distribution lines and delivered to consumers"; and that "such process is necessary in order to the utilization of those devices and appliances used by consumers of electrical energy".

Plaintiff further specifically excepts to that portion of Finding No. V. to the effect that "the Court finds that it is not true that the system of the plaintiff is purely a transferring device; but that the primary and essential function of the generator is to convert energy from the mechanical into the electrical form and to produce an electrical cur-

rent, and that the primary and essential function of the transformer is to prepare the energy flow for transmission through the induction of a new and separate current of higher voltage which may be economically transmitted"; and that "the consumer receives and must receive both current and power; and that the measurement of electrical power generated or delivered to the consumer is the product of current and voltage. The original source of both electric power and electric current is in the generator.

[fol. 126] XXVII

Plaintiff excepts to Finding No. VI. to the effect that "as to each of such stations (stations in Idaho) a use of water is had and enjoyed by plaintiff under permit and license of the State of Idaho"; and that "the electrical energy so obtained by utilization of such power of falling water is in all respects identical with the electrical energy obtained through the utilization of power of burning fuel".

With respect to the Conclusions of Law requested by the plaintiff and those made by the Court, the plaintiff generally and specifically excepts to each Conclusion of Law made by the Court to the effect that the said Tax Act does not violate the various provisions of the Constitution of the United States and the Constitution of the State of Idaho specifically recited in said Conclusions and in not concluding that said Tax Act does violate each and every constitutional provision recited and referred to in plaintiff's Bill of Complaint.

Respectfully submitted.

John F. MacLane, Geo. R. Corey, Hawley & Worthwine, Merrill & Merrill, Solicitors for the Plaintiff.

[fol. 127] In United States District Court

[Title omitted]

Order Allowing Exceptions—Filed Feb. 15, 1932

The exceptions of plaintiff to refusal of Court to make and enter findings of fact and conclusions of law proposed by plaintiff and exceptions to findings and conclu-

sions made and entered and decree thereon having been duly presented to the Court herein:

Now, therefore, upon consideration, it is hereby ordered that said Exceptions generally and separately are each and all allowed.

Dated this 7th day of February, 1932.

Wm. H. Sawtelle, J. Stanley Webster, Charles C. Cavanah, Judges.

[File endorsement omitted.]

[fol. 128] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT FOR THE DISTRICT OF IDAHO, SOUTHERN DIVISION

In Equity. No. 1621

UTAH POWER & LIGHT COMPANY, a Corporation, Plaintiff,

vs.

EMMITT PFOST, Commissioner of Law Enforcement of the State of Idaho, and Fred J. Babcock, Attorney General of the State of Idaho, Defendants

FINDINGS OF FACT AND CONCLUSIONS OF LAW—Filed Feb. 15, 1932

This cause came on regularly for hearing before the Hon. William H. Sawtelle, Circuit Judge, and J. Stanley Webster and Charles C. Cavanah, District Judges, sitting as a statutory three-judge court, on the 2nd day of July, 1931, upon the application of the plaintiff herein for an interlocutory injunction, and the cause having been argued and submitted to the Court and the Court having filed its Memorandum Opinion denying the contentions of the plaintiff in all respects save and except as to the allegations in said complaint that the act in question contravened the provisions of Article I, Section 8, Clause 3 of the Constitution of the United States, which question was thereafter to be [fol. 129] submitted upon the evidence to be taken, and an Order having been entered granting the said interlocutory

injunction, said cause came on for final hearing upon the issues framed by the Bill of Complaint of the plaintiff and the amended answer of the defendants thereto.

Evidence was introduced by and on behalf of the respective parties before a Master, pursuant to an order of Court limiting the taking of testimony before said Master to the issue of fact relating to the Interstate Commerce clause of the Constitution, and said Master having made his report and filed said testimony in said Court and further briefs having been filed by the parties, the Court, pursuant to Equity Rule No. 70½ of the Supreme Court of the United States, makes the following Findings of Fact, to-wit:

I

The first seven paragraphs of the Bill of Complaint are admitted to be true by the amended answer of the defendants, save and except it is denied by the defendants that the plaintiff is or has been engaged in generating electrical energy in interstate commerce between states, or that electrical energy may be generated in interstate commerce; and denied that the defendant Commissioner will construe the Tax Act, hereinafter referred to, to apply to all electricity produced by the plaintiff, but only to such as is pro-
[fol. 130] duced for barter, sale or exchange. With respect to the disputed allegations in said paragraphs the Court finds that the defendants are charged with the duty of enforcing the provisions of that certain Tax Act passed by the Legislature of the State of Idaho in Extraordinary Session March 17, 1931, by the terms of which a tax of one-half mill per kilowatt hour is imposed upon the producer of electricity generated or produced within the State of Idaho for barter, sale or exchange. The defendants have prescribed forms and have notified the plaintiff that it must pay such tax as provided for in said Act without regard to whether or not said electrical energy is consumed within or without the State of Idaho and irrespective of transmission losses, but not including such electrical energy as is used by the plaintiff in station uses. Defendants will attempt to collect only such penalties of plaintiff as accrue under the provisions of this Act, subject to the decree of this Court, for failure to pay a tax on electricity generated for barter, sale and exchange.

II

The plaintiff owns and operates an electric power system consisting of generating stations, transmission and distribution lines, and other electrical equipment located in the States of Idaho, Utah and Wyoming, so interconnected as to enable plaintiff to deliver electrical energy to any place [fol. 131] on their transmission and distribution lines from any generating station connected to their system. Energy in the electrical form is generated by plaintiff and transmitted, distributed and delivered in barter, sale and exchange to its customers in each of said states. As part of said system, plaintiff owns and operates several hydro-electric stations located in the State of Idaho; consisting of certain stations on the Bear River known as Soda, Grace, Cove and Oneida, and stations at Ashton, St. Anthony, Idaho Falls, Shelley, Paris, High Creek and Georgetown.

During the year 1930 there was generated or produced in or by those generating stations of plaintiff located in Idaho, electricity measured through integrating watt hour recording meters in terms of 233,253,000 kilowatt hours, of which 199,968,000 kilowatt hours were generated at its Bear River stations in Idaho, and 33,285,000 kilowatt hours were generated at its other Idaho stations. Of the kilowatt hours so generated, 6,978,000 kilowatt hours were used for station uses at Idaho stations, 24,046,000 kilowatt hours were delivered to its Idaho consumers or used at its division offices, 198,502,000 kilowatt hours were for transmission to Utah and the remainder consumed by transmission and other losses.

The Soda, Grace, Cove and Oneida stations have a combined capacity of 95,500 kilowatts and deliver most of their output to three 130,000 volt transmission lines extending directly from said stations through Idaho to a station named "Wheelon" in Utah and thence to a receiving and [fol. 132] switching station named "Terminal" near Salt Lake City, Utah.

There is no delivery of electricity from said 130,000 volt lines in Idaho, the first use therefrom being at Wheelon, Utah, and the principal use of said electricity being at Points to which it is delivered in Utah and Wyoming after the same has passed through said Terminal Station. The

measured output of the Bear River stations in Idaho to the 130,000 volt transmission lines was 161,649,000 kilowatt hours.

The local customer deliveries in Idaho from the Idaho stations last above mentioned are from separate outgoing lines segregated at the generating bus. Approximately two per cent. of the energy generated at said stations is delivered to local customers in Idaho. In addition to electricity transmitted over said 130,000 volt lines, some electricity from said stations is also delivered to Utah over 44,000 volt lines from the Grace station.

The operations described for the year 1930 are similar to and descriptive of plaintiff's operations as the same are now practiced during 1931; that it is a matter of speculation as to where markets will exist in the future for the electrical energy generated by plaintiff at its said Idaho stations.

[fol. 133]

III

Upon the above described property, and in connection with its business aforesaid, plaintiff has been and will continue to be required to pay annually, taxes imposed under the general tax laws of Idaho, as follows:

(a) A general property tax levied annually upon all property, real and personal, of the plaintiff, situated within the State of Idaho, in proportion to its value, in common with all other property in the State not exempt from taxation. Plaintiff has paid such general property tax upon its property in Idaho annually; this tax for the year 1930 amounted to $412,090.07 and was based upon an assessed valuation of $11,088,009.00; and a like assessment will be made and a like tax levied and paid for the calendar year 1931, and in subsequent years.

(b) An annual license or corporation franchise tax for the right to exist and do business in Idaho as a corporation, based upon plaintiff's authorized capital stock, which tax plaintiff has paid annually since its incorporation and qualification to do business in Idaho.

(c) An income tax, effective July 1, 1931, levied and collected upon the net income of plaintiff in Idaho.

[fol. 134] IV

Under said Tax Act and in accordance with the interpretation placed thereon by the Commissioner, plaintiff would have paid for the year 1930, has said Tax Act been then effective, an amount in excess of $100,000.00. The gross business of the plaintiff in Idaho for the year 1930, from the production and sale of electricity within said state, amounted to approximately $735,000.00.

V

The terms "generation", "manufacture", and "production", as applied to energy in the electrical form are synonymous designations applied to the essential process of converting or transforming energy taken from some source in nature, (i. e., the power in falling water or the power of burning fuel) into energy in the electrical form in order to its use in electrical appliances and devices. The electrical energy so generated is an energy with new and different physical characteristics and new and different uses than energy in other forms, and may be transported and delivered with greater economy and facility. In particular, and as related to plaintiff's system, such electrical energy is adapted to and employed in the operation or use of various devices and appliances by plaintiff's customers which will not function with other than electrical energy, or will not function with like convenience, facility or con-
[fol. 135] trol, or is sold to others who wish electrical energy for distribution and sale.

Such generation is accomplished by means of certain mechanical devices designed, constructed, and employed by man for such purpose, and the electrical energy so produced is in the process of generation given certain definite characteristics with reference to voltage, frequency and its character as director or alternating current as desired and as required by the needs of customers or the character of the system. These characteristics are variable according to the character of the machinery employed.

The process of conversion to energy in the electrical form is completed at the generator and before the pulses of energy leave the generator in their flow to the station bus or transformer. The amount of energy so converted is capable of exact measurement at such point, and is com-

monly measured there by plaintiff. And the amount of electrical energy so generated and measured is substantially greater than the amount which plaintiff may deliver to Utah or any distant point by reason of losses occurring in the subsequent process of transforming the flow of energy to a different current and voltage in order to transmission, and in or from the transmission line.

[fol. 136] Electricity in motion constitutes an electrical current. The fundamental unit of measurement of electric power is the watt, which is the product of the electrical current and the voltage or pressure. Power manifesting itself through the instrumentality of electric current and voltage is known as electric power, and electrical energy is electrical power generated over a period of time. The kilowatt hour is a unit of measurement of the amount of electrical energy equal to generation at the rate of one kilowatt (or thousand watts) for one hour. The Court finds that the kilowatt hour is the unit of measurement commonly employed in the electrical industry, with regard either to amounts generated, transmitted, sold or delivered, of a quantity of electrical energy that will accomplish a certain, definite amount of mechanical work, and which may be generated and/or delivered or used within the period of less than a second or over the course of hours. That the kilowatt hour is a unit of measurement of a definite physical entity, and of a commercial commodity produced by plaintiff for transmission, delivery and sale to its customers, and/or purchased by plaintiff from other producers for such transmission, delivery and sale by plaintiff. It is not a measurement of a period of time nor of service. Plaintiff delivers energy to its consumers or purchasers only in the electrical form, and measures amounts delivered only in such form.

[fol. 137] In the operation of plaintiff's system, electrical energy passes from the generator to a transformer immediately adjacent to the generating station. Because the electrical energy produced by plaintiff cannot be transmitted to Terminal station as the same electrical current and with the same voltage at which generated without a loss in transmission, in the consumption by or loss of energy from the transmission line, of substantially the greater part of the electrical energy generated, the transformers are in-

terposed to produce a different current and higher voltage which may be transmitted without a similar loss or consumption. Plaintiff generates at 2300 or 6600 volts and transmits at 130,000 volts. With the separate current so induced and such higher voltage, plaintiff transmits electrical energy to Terminal station with substantially less loss from or consumption by the transmission line.

Such changes in the physical characteristics of the flow of energy from the generator and the production of a separate current are required in order to and in preparation for transmission, and the same are substantial in character; in that electrical devices or appliances designed to function with the current and voltage at which plaintiff generates would not function with the current and voltage at which the energy flows from such transformer.

Similarly, the current and voltage transmitted is not in most instances delivered to the consumer, but by the inter- [fol. 138] position of other transformers a separate current of lower voltage than that transmitted (and of lower voltage than that produced at the generator) is induced in the transformer coils connected to the distribution lines and delivered to consumers. And such process is necessary in order to the utilization of those devices and appliances used by consumers of electrical energy.

The Court finds that it is not true that the entire system of plaintiff is purely a transferring device; but that the primary and essential function of the generator is to convert energy from the mechanical into the electrical form and to produce an electrical current, and that the primary and essential function of the transformer is to prepare the energy flow for transmission through the induction of a new and separate current of higher voltage which may be economically transmitted. The functioning of the transformer is with respect to any electrical energy generated by plaintiff subsequent to its production and to the measurement of amounts generated.

The Court finds that the flow of power or energy from its natural source is, during the operation of plaintiff's system and use by consumers, continuous from the falling water to the consumers' devices and at the speed of approximately 186,000 miles per second; and that it is power or energy [fol. 139] which is consumed by such device; but that the

consumer receives and must receive both current and power; and that the measurement of electrical power generated, or delivered to the consumer, is the product of current and voltage. The original source of both electric power and electric current is in the generator.

VI

The electrical energy demanded by plaintiff's customers is supplied by such station or stations, whether in Idaho or in Utah, as designated by plaintiff's dispatcher at Terminal station, under whose directions different stations may be selected to meet the demand then being made for electrical energy, or the demand apportioned between different stations in varying amount, or such demand or a part thereof made upon the stations of the Idaho Power Company from whom plaintiff purchases electrical energy. In addition to the amounts of electrical energy generated by plaintiff's stations in Idaho the plaintiff also purchases substantial amounts of electrical energy from the Idaho Power Company, which is sold and delivered to plaintiff in measured amounts in Idaho for delivery by plaintiff to customers in Utah in satisfaction of their, or a part of the above mentioned, demands.

Plaintiff's generating stations in Idaho are located in such points as enable it to use the power in falling water [fol. 140] from the streams and watersheds of Idaho, in lieu of power obtained from burning fuel. As to each of such stations, a use of water is had and enjoyed by plaintiff under permit and license of the State of Idaho. The electrical energy so obtained by utilization of such power of falling water is in all respects identical with the electrical energy obtained through the utilization of power of burning fuel, and in practical operations the producer's choice between such sources of power is one dictated by economic factors.

The character of electric energy as generated at said Idaho stations of plaintiff is such that the same may be delivered and sold in barter, sale or exchange, and used, at or in the vicinity of the plant, or at or to any other places in Idaho within a radius of two hundred miles or more, where customers and uses and markets may be found or developed therefor, or to demands from industries or

uses which may hereafter be developed in such territory. Said generating stations of plaintiff other than those referred to as the Bear River Stations are commonly operated primarily for the supply of markets local to the station; but the Court finds that the functioning of the generator and generating station is essentially the same without regard to the place from which its energy output is demanded and to which it is delivered by the transmission network, operating under control of the dispatcher.

[fol. 141] Similarly, the percentage of the output of any station which is delivered by the transmission and distribution lines to consumers is dependent upon the character of construction and efficiency of maintenance of the transmission and distribution lines, and the equipment used in connection with such lines, not upon any characteristic of the generator.

The Court further finds that the amount of electrical energy delivered to or passing any point upon plaintiff's transmission or distribution lines, or the losses between any two points, may be exactly and definitely measured and ascertained, and that in common practice this is done as a commercial operation.

[fol. 142] From the foregoing Facts, the Court makes the following

Conclusions of Law

I

That said Tax Act does not violate the Fourteenth Amendment of the Constitution of the United States in that it does not deny the plaintiff, engaged in the business of generating or producing electricity and electrical energy in the State of Idaho, equal protection of the laws and does not render its property liable to be taken without due process of law.

II

That said Tax Act does not violate the Fourteenth Amendment in that Section 5 does not compel the appropriation and payment of money for the benefit of private individuals.

III

That said Tax Act does not violate Article III, Section 16 of the Constitution of the State of Idaho, which provides that every Act shall embrace but one subject and matters properly connected therewith, which subject shall be expressed in the title in that the provisions of said Act are in each necessary particular expressed in the title, and said Act embraces but one subject.

[fol. 143]

IV

That said Tax Act does not violate Section 13 of Article I of the Constitution of the State of Idaho in that the plaintiff is not deprived of its property without due process of law.

V

That said Tax Act does not violate Section 2 of Article VIII and Section 2 of Article VII of the Constitution of the State of Idaho, in that said Tax Act does not constitute the levying of a tax for other than a public purpose nor constitute the levying of a tax for the benefit of an individual.

VI

That said Tax Act does not violate Section 6 of Article VII of the Constitution of the State of Idaho in that it does not impose a tax for the benefit of a municipal corporation, to-wit: an irrigation district.

VII

That said Tax Act does not constitute a violation of Section 2 of Article VII of the Constitution of the State of Idaho and that it does not impose a double license tax for the same purpose, in that said Tax Act imposes an excise tax upon the producer of electrical energy for barter, sale, or exchange; whereas the license tax imposed upon plain-
[fol. 144] tiff is a corporate franchise tax for the privilege of existing and doing business in the state as a corporate entity.

VIII

That said Tax Act does not violate Section 2 of Article VII of the Constitution of the State of Idaho in failing to provide for the levying of the tax according to valuation,

nor Section 5 of Article VII in that it does not provide for the levying of a uniform tax upon the same class of subjects within the territorial limits of the authority levying the tax, nor constitute double taxation, in that said tax is not a property tax but an encise tax.

IX

That said Tax Act does not violate the provision of Section 9 of Article IV of the Constitution of the State of Idaho, in that the determination of the Governor as to whether or not an extraordinary session exists for the calling of a special session of the legislature is conclusive upon the courts.

X

That said Tax Act is not void for uncertainties and ambiguities.

[fol. 145]

XI

That said Tax Act does not violate Clause 3, Section 8, Article I of the Constitution of the United States, in that it does not impose a burden upon any act of interstate commerce. That the generation of electrical energy by plaintiff's generation stations is an act of intrastate commerce.

XII

That defendants are entitled to a decree dissolving the interlocutory injunction heretofore issued in said cause, and requiring the plaintiff to pay the accumulated tax with interest and costs, but without penalties during the pendency of this action.

Let the Decree be entered accordingly.
Dated this 30 day of January, 1932.
Wm. H. Sawtelle, J. Stanley Webster, Charles C. Cavanah, Judges.

[fol. 146] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT FOR THE DISTRICT OF IDAHO, SOUTERN DIVISION

In Equity. No. 1621

UTAH POWER & LIGHT COMPANY, a Corporation, Plaintiff,

vs.

EMMITT PFOST, Commissioner of Law Enforcement of the State of Idaho, and Fred J. Babcock, Attorney General of the State of Idaho, Defendants

DECREE—Filed Feb. 15, 1932

This cause came on to be further heard at this term on the merits and was submitted by counsel and thereupon, upon consideration thereof, it was ordered, adjudged and decreed as follows, viz:

That the Interlocutory Injunction heretofore granted in this cause be dissolved, and that the tax required by the Act here in question, more specifically referred to in Paragraph IV of Plaintiff's Bill of Complaint, with interest thereon as therein provided, but without any penalties as provided for in said Act which may have accrued during the pendency of this action, be paid by the plaintiff to the State of Idaho;

That defendants recover from plaintiff their costs herein and tax in the sum of $244.99.

[fols. 147-149] Dated February 8, 1932.

Wm. H. Sawtelle, J. Stanley Webster, Charles C. Cavanah, Judges.

[fol. 150] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT IN AND FOR THE DISTRICT OF IDAHO, SOUTHERN DIVISION

No. 1621

UTAH POWER & LIGHT COMPANY, a Corporation, Plaintiff,

against

EMMITT PROST, Commissioner of Law Enforcement of the State of Idaho, and Fred J. Babcock, Attorney General of the State of Idaho, Defendants

Statement of Evidence—Filed Feb. 15, 1932

This cause was brought to enjoin the enforcement as against the plaintiff, of an act of the Legislature of Idaho passed at the Extraordinary 1931 Session thereof, levying a tax of one-half mill per kilowatt hour with respect to electric energy "generated, manufactured or produced" within the State of Idaho for "barter, sale or exchange." A copy of the act is attached to plaintiff's Bill of Complaint as Exhibit A.

The grounds on which injunction was sought are fully stated in the Bill and involve questions of both State and Federal constitutional law intrinsic in the act, and the extrinsic ground that, as applied to the plaintiff, the act imposes a burden on interstate commerce in electric energy between Idaho, Utah and Wyoming.

On plaintiff's application for interlocutory injunction, a Special Statutory Court, consisting of Sawtelle, Circuit Judge, Webster and Cavanah, District Judges was convened at Boise, Idaho on the 2nd day of July, 1931; an order restraining the enforcement of the tax pending decision on the application was granted and on the 20th day of August, 1931, a decision was filed by said Court (memorandum opinion by Judge Cavanah) in which the act was sustained against all objections of the plaintiff intrinsic to the act, but reserving for hearing on the merits, the question [fol. 151] of whether, as applied to the plaintiff, the act imposes a burden on interstate commerce, and an interlocu-

tory injunction was granted. L. O. Hamilton was appointed by the Court as Master to take testimony on this question and report to the Court, without findings.

The cause came on for final hearing before said Special Master at Seattle, Washington, pursuant to agreement of the parties, on September 30, 1931, the plaintiff appearing by John F. MacLane, Esq., of New York City, and George R. Corey, Esq., of Salt Lake City, Utah, and the defendants appearing by Hon. Fred J. Babcock, Attorney General of the State of Idaho, and Hon. Sidman I. Barber, Assistant Attorney General of the State of Idaho.

The following proceedings were had:

STIPULATION RE ORIGINAL ANSWER

It was stipulated, in lieu of the plaintiff's offering in evidence the original answer of the defendants, as follows:

The original answer filed on or about September 2, 1931, contained in Paragraph XII thereof the following clause:

"Defendants admit that the generation, transmission and use of electric energy is in practical operation continuous and practically simultaneous, and that at the time of use of electrical energy by the consumer there is a continuous electrical and electro-magnetic path between the windings in the generator and the windings in the consumer's motor."

The amended answer filed on or about September 22, 1931, in Paragraph XII omits or modifies the language above quoted to read as follows:

"Defendants deny that the generation, transmission and use of electrical energy is continuous or simultaneous; admit that at the time of use of electrical energy by the consumer (except for the interposition and operation of transformers as hereafter set forth) there is a continuous electrical and electro-magnetic path."

The underscored words in the following quotation from [fol. 152] Paragraph XII are new to the amended answer, and were not in the original answer:

"and allege the fact to be that an additional amount of electrical energy is required to be and is generated in order

to permit *the production at the transformer,* and transmission and delivery of the energy required by the consumer to his devices *and that the electrical current produced at the generators is not the same current which is delivered to the consumer.*"

Also the following:

"*but allege that the electrical current produced at such stations is not transmitted to Terminal Station but is employed for the production of a new and different current in the transformer which is transmitted to the said Terminal Station.*"

Also immediately following the last quotation are the words:

"Defendants *deny* that power or electricity generated at various Utah stations is transmitted to Terminal Station," and in place thereof the original answer reads:

"Defendants admit that power or electricity generated at various Utah stations is transmitted to Terminal Station."

Also, the following language of the amended answer is entirely new thereto and is not contained in the original answer (beginning with the paragraph of Paragraph "12", on page 14, reading as follows):

"Such generation, manufacture or production is accomplished by the utilization of power obtained from burning fuel, or of natural or created sources of waterpower. The force of the water or steam pushing against the blades of the turbine wheel causes the turbine shaft to revolve and with it the rotating portion of the electric generator. As a result of the continuous motion of a system of electrical conductors across a magnetic field which is maintained in the generator by separate excitation of its field coils, electrical energy is made available at the stator or stationary [fol. 153] part of the generator and consuming devices or appliances may be connected by wires thereto and the energy so generated used at such place." * * *

(continuing through the paragraph, on page 16 of said paragraph "12", reading as follows:)

"Similarly, the current transmitted is not in most instances the current delivered to the consumer, but by the interposition of other transformers a current of lower voltage than that transmitted (and of lower voltage than that produced at the generator) is induced in the transformer coils connected to the distribution lines and delivered to consumers."

In response to a question of Mr. Barber as to the purpose of this excerpt Mr. Maclane stated:

"Primarily to show that the interjection of the detailed questions of the operation of transformers occurred subsequently to the taking of our depositions in the East, and to explain the reason why we didn't go into the technical discussion of the nature of electric current and electricity, and of voltage, with Dr. Millikan and Dr. Langmuir. I may also suggest from this record, that possibly the amendment in the answer was due in part to the decision of the Federal Court in Carolina on similar questions to those involved in this case."

* * * * * * *

Under objection by Mr. Barber on the ground that it is incompetent, irrelevant and immaterial, and, particularly, that it is not relevant to any issue in this case, under decision of the court on motion for temporary injunction, and by stipulation that subject to such objection and ruling of the court thereon, it is offered in lieu of the testimony of Fred Lukens, Secretary of State of Idaho, there was offered in evidence by the plaintiff the affidavit of said Fred Lukens containing certified copies of the transcript of the proceedings of the 1931 regular and extraordinary sessions of the Legislature of Idaho in respect to the introduction, consideration and passage of the Tax Act involved [fol. 154] in this case, said affidavit being received with the same effect as if Mr. Lukens were personally present and had testified as stated in such affidavit.

Affidavit of Fred E. Lukens

The affidavit condensed and reduced to narrative form is as follows:

My name is Fred E. Lukens, residence, Boise, Idaho. I am now and ever since the 5th day of January, 1931, have

been the duly elected, qualified and acting Secretary of the State of Idaho, and as such have under my control and in my possession all journals and records of the Twenty-first session of the Legislature of the State of Idaho and of the Extraordinary Session of the Twenty-first Legislature of the State of Idaho; that the regular session of said Legislature convened at Boise, Ada County, Idaho, on the 5th day of January, 1931, and adjourned sine die at nine o'clock p. m. on the 5th day of March, 1931; that the Extraordinary Session of the Twenty-first Legislature of the State of Idaho convened at Boise, Ada County, Idaho, at twelve o'clock noon on the 6th day of March, 1931, and adjourned at 5:30 o'clock p. m. on the 13th day of March, 1931.

That at the regular session of the Legislature there was introduced and duly and regularly passed and signed by the Governor House Bill No. 340, as follows:

"Levying an ad valorem tax for each of the fiscal years 1931 and 1932 to provide revenue to pay the necessary general expenses of the state of Idaho during the period beginning January 1, 1931, and ending December 31, 1932, and other general expenditures of the state, and declaring an emergency

"Be it enacted by the Legislature of the State of Idaho:

"Section 1. That there is hereby levied an annual ad valorem tax of Two Million Two Hundred and Fifty Thousand Dollars ($2,250,000.00) for each of the fiscal years 1931 and 1932, upon all the property in the State of Idaho not legally exempt from taxation for the purpose of providing revenue to pay the necessary general expenses of the state during the period beginning on the first day of January, 1931, and ending on the 31st day of December, 1932, and other general expenditures of the State.

[fol. 155] "Section 2. An emergency existing therefor, which emergency is hereby declared to exist, this act shall be in force and effect from and after its passage and approval."

That said Act, last above recited, is a law in full force and effect in the State of Idaho.

That during the regular session of the Twenty-first Session of said Legislature, to-wit: on the 29th day of January, 1931, there was introduced in the House of Representatives House Bill No. 44, which said Bill was amended in several instances and as amended is substantially identical with House Bill No. 3, passed by the Extraordinary Session of the State of Idaho, except it did not contain Section 5 which appears in House Bill #3; that House Bill No. 44 was considered by the Committee of the House on Revenue and Taxation and pursued its regular course on the calendar and reached third reading. Thereupon motion prevailed that House Bill 44 retain its place on the calendar for consideration Thursday, March 5, 1931. On Thursday, March 5, 1931, House Bill 44 was, with unanimous consent, withdrawn.

On March 5, 1931, there was offered and read in regular session of the House and also of the Senate a communication from the Governor in the following language:

"Proclamation.

"Whereas, the failure of the regular session of the Legislature to enact tax laws, to meet the pressing demands of the State requires the convening of a special session of the State Legislature;

"Now, therefore, I, C. Ben Ross, Governor of the State of Idaho, by virtue of authority in me vested, by this Proclamation call the Legislature of the State of Idaho to meet in special session at the Capitol at Boise City, in Ada County, Idaho, on the 6th day of March, 1931, at 12 o'clock M. for the following purposes and none other, to-wit:

"For the purpose of considering and enacting laws, imposing taxes for raising of the needful public revenues, considering and determining the form and scope of such taxation, the manner of levying the same, and the subjects of such taxation and each and every matter necessary to a full consideration and enactment of such laws, and any and all matters affecting the public revenues and the levying and collecting of taxes for public purposes, and to consider and propose amendments to the revenue provisions of the Constitution of the State of Idaho;

[fol. 156] "The Legislature may also provide for the expenses of the session, and other matters incidental thereto.

"In witness whereof I have hereunto set my hand and caused the seal of the State of Idaho to be affixed by the Secretary of State, this 5th day of March, 1931.

(Signed) C. Ben Ross, Governor."

That said Proclamation was filed in my office on March 5, 1931, at 4 P. M. of said day.

That at noon on March 6, 1931, said Legislature met, pursuant to the Proclamation, in special session and heard read the foregoing Proclamation and also received from the Governor the following message:

"Message from the Governor

"Members of the Legislature of the State of Idaho, convened in extraordinary session March 6, 1931:

"You have been called in extraordinary session after a long and arduous siege dealing with legislative matters during the last sixty days to complete what, in my opinion, is the most important part of our legislative program, the thing that strikes at the very foundation of our government, taxation.

"While you are now free from all other legislative duties, your attention for the next few days can be devoted to this intricate question.

"Idaho is a young and growing State of less than 500,000 individuals, and since the necessary cost of carrying on our State Government is naturally nearly as burdensome as it would be if our population were much larger, it becomes imperative that every individual and corporation should carry his or its share of the burden of taxation. Interested taxpayers and citizens of Idaho have for the last six weeks been laboring on a tax measure which, it is believed, will go a great ways towards solving the present tax problem of the State of Idaho. The result of the labor and consideration given this question is generally embodied in what was termed House Bill No. 266, during the session of the legislature just ended. Numerous amendments have been proposed and discussions had concerning the provisions of this proposed bill. However, they have generally been of minor importance. The bill has been printed for some time, has been in the hands of the legislature and generally circulated throughout the State of Idaho, and the

taxpayers who are affected, thereby, are undoubtedly more familiar with the provisions of the same than with any other proposed legislation. This bill can and should be used as a basis for the necessary tax legislation.

"I have taken the liberty of calling this particular bill to your attention for the reason that the tax question is necessarily a complicated problem, the details of which [fol. 157] must be worked out by a small group of informed and interested persons for the consideration of a larger group, and it is to be hoped and you will give this particular bill your very serious consideration before an attempt is made to prepare another tax measure.

"You have heretofore had before you for your consideration the question of a tax upon electrical energy developed from the natural resources of the State of Idaho. While it is true that the interests developing this energy are paying taxes on the physical property used in the development of these natural resources, nevertheless it is my opinion that electrical energy generated from our natural resources should be required to bear at least a portion of the burden of taxation for the benefit of our people, and a small tax should be placed on this class of property, and inasmuch as the control of the development of electrical energy in the State of Idaho at the present time amounts to a monopoly, such a tax as suggested cannot be unreasonable.

"The Constitution of Idaho touching upon the matters of revenue should be broadened to such a degree as to give the legislative bodies a wider power and more authority in the matter of taxing the various kinds of property within the State of Idaho, and I respectfully call your attention to this matter so that a joint resolution may be introduced submitting to the people of Idaho the question of amending the constitution.

"Respectfully submitted.

"C. Ben Ross, Governor."

That at the Extraordinady Session of said Legislature there was introduced and passed House Bill No. 3, being "an Act levying a license tax of one-half mill per kilowatt hour on electricity and electrical energy generated, manufactured or produced in the State of Idaho for barter, sale or exchange; and providing for the collection and distribution of such tax; and for forms and procedure to be used

and followed; requiring reports of the production of electricity and electrical energy and the furnishing of equipment for measuring same; prescribing penalties for violation of this act; exempting from such license tax the electricity and electrical energy actually used for pumping water for irrigation purposes on lands in the State of Idaho and providing that such exemptions shall accrue to the benefit of the consumer of such electricity and electrical energy; prescribing the duties of the State Commissioner of law enforcement under this act, requiring him to give a bond of [fol. 157½] the faithful performance of said duties and fixing the amount thereof, and making an appropriation with which to carry out its purposes," which said Act is further set out in full and at length as Exhibit "A", attached to the Bill of Complaint in this action and became Chapter 3 of the Laws of said Extraordinary Session of 1931.

That said Extraordinady Session adjourned March 13, 1931, and said Bill was signed by the Governor on March 17, 1931.

STIPULATION RE EXHIBIT "A"

It was stipulated that Exhibit A, attached to plaintiff's Bill of Complaint, is a true and correct copy of the Tax Act involved in the case, to be considered as plaintiff's Exhibit A without further identification.

* * * * * * * * *

Subject to objection as incompetent, irrelevant and immaterial, and not pertinent to the issues under the decision on motion for preliminary injunction, but waiving objection to the failure to produce the defendant Emmitt Pfost, Commissioner of Law Enforcement of Idaho, personally, or the Secretary of the Company, to whom the letter was addressed, for the purpose of identifying the exhibit, there was offered in evidence as plaintiff's Exhibit B, a certified copy of the letter directed by defendant Commissioner to the Secretary of plaintiff company, under date of June 30, 1931, having attached thereto a printed form of license tax statement required by Section 4 of the Tax Act and the so-called "Certificate of Producer" required by Section 3 of the Tax Act, which letter and statement are as follows:

[fol. 158] PLAINTIFF'S EXHIBIT "B"

U. S. District Court, District of Idaho. Filed Jul. 2, 1931.
W. D. McReynolds, Clerk, by —— ——, Deputy

IN THE DISTRICT COURT OF THE UNITED STATES FOR THE DISTRICT OF IDAHO, SOUTHERN DIVISION

In Equity. No. 1621

UTAH POWER & LIGHT COMPANY, a Corporation, Plaintiff,

against

EMMITT PFOST, Commissioner of Law Enforcement of the State of Idaho, and Fred J. Babcock, Attorney General of the State of Idaho, Defendants

State of Idaho, Department of Law Enforcement

UNITED STATES OF AMERICA,
State of Idaho, ss:

I, Emmitt Pfost, the duly appointed, qualified and acting Commissioner of Law Enforcement of the State of Idaho, do hereby certify that the annexed forms entitled "License tax statement" and "Certificate of producer of electrical energy for barter, sale or exchange," are true and correct copies of the forms of statements which I have prescribed pursuant to the provisions of Chapter 3, Laws of the Extraordinary Session of the Twenty-first Legislature of the State of Idaho.

I do further certify that on June 30, 1931, I transmitted said forms to the Utah Power & Light Company, together with a letter, a true copy of which is attached hereto.

In testimony whereof I have hereunto set my hand and affixed the seal of my office this 1st day of July, 1931.

Emmitt Pfost, Commissioner Department of Law Enforcement, by Ines Yturri, Deputy. (Seal.)

[fol. 159]

June 30th, 1931.

Mr. Geo. B. Thomas, Secy. Utah Power & Light Company, Kearns Building, Salt Lake City, Utah.

DEAR SIR: Enclosed please find one copy of "Certificate of Producer of Electrical Energy for Barter, Sale, or Ex-

change", and six copies of Monthly "License Tax Statement", as provided for in Chapter 3, Laws of the Extraordinary Session of the Twenty First Legislature of the State of Idaho.

The Certificate of registration is to be filed in this Department once prior to the filing of the License Tax Statements which are filed each month. First payments of one-half mill per kilowatt hour on electricity and electrical energy generated, manufactured or produced in the State of Idaho for barter, sale, or exchange, are due July 15, 1931.

Kindly file your Certificate of Registration as soon as possible with this Department for the current year, and file the monthly statements each month on the enclosed blanks.

Respectfully yours, (Signed) Emmitt Pfost, Commissioner Department of Law Enforcement.

[fol. 160] License Tax Statement to the Commissioner of Law Enforcement of Idaho of Electrical Energy Generated in Idaho for Barter, Sale, or Exchange, Calendar Month of ——, 193-.

1. Name of Producer: —— ——.

2. Total kilowatt hours electrical energy generated in State during month ..... —— KWH.

3. Total kilowatt hours (included in item 2) furnished for pumping water (not sold or rented) for irrigation purposes on lands within State of Idaho ..... ——

4. Total kilowatt hours (included in item 2) actually transformed into power or light by Producer for use personal to it, and not bartered, sold or exchanged; exclusive of losses in transmission ..... ——

—— —— KWH.

5. Net Taxable Generation (item 2 minus items 3 and 4) ..... —— KWH.

6. Tax due (½ mill per KWH. on net) ..... $——

7. Statement of annual credits made on power bills of consumers of electrical energy furnished for pumping water (not sold or rented) for irrigation purposes on lands within the State of Idaho, to the full amount of tax which would be due on such energy if not exempt. (Attach as Schedule A)

Total ..... $——

STATE OF ——,
County of ——, ss:

—— ——, being first duly sworn, on oath says that he is —— of ——; that as such officer he has supervision over the books, records and accounts of said Producer; that he knows that such books have been kept in good faith during the period covered by the foregoing statement and with respect to the matters therein set forth, show an accurate and full record of the facts hereinabove set forth; that he has examined the said statement, and to the best of his knowledge, information and belief the information given in said report is full, true and correct.

—— ——.

Subscribed and sworn to before me this —— day of ——, 193-. —— ——, Notary Public for ——, Residing at ——.

NOTE.—This statement must be filed with the Commissioner of Law Enforcement of Idaho on or before the 15th day of each month, beginning July 15, 193-, together with payment of the amount of license tax due.

[fol. 161] Certificate of Producer of Electrical Energy for Barter, Sale, or Exchange

To the Commissioner of Law Enforcement, State of Idaho:

The within named Producer, engaged in the generation, manufacture, or production of electricity and electrical energy in the State of Idaho, for barter, sale or exchange, in compliance with the provisions of Chapter 3, Laws of the Extraordinary Session of the Twenty-first Legislature of the State of Idaho, does hereby certify:

(a) That the name under which the producer is transacting business in the State of Idaho is: ——

(b) Post Office address and principal place of business within the State: ——

(c) Address and location of production plants or stations in Idaho: ——.

(d) Name and address of managing agent: ——.

(e) 1. Names and addresses of persons composing firm or partnership constituting Producer: ——.

2. Producer is a corporation, organized under the laws of the State of ——, with its principal place of business at ——, and authorized to transact business under the corporate name of ——; that the following are the names and addresses of its officers, directors, resident general agent, and attorney-in-fact, to-wit: ——.

(f) Said Producer attaches hereto, as a part of this certificate, copy of Articles of Incorporation, certified by Secretary of State of Idaho; and if a foreign corporation, in addition thereto, copies of State license and of designation of statutory agent so certified.

In witness whereof said producer has caused this certificate to be executed this — day of ——, 193-.

—— ——, by —— ——.

Attest: —— ——.

STATE OF ——,
County of ——, ss:

On this — day of ——, in the year ——, before me, ——, a Notary Public in and for the State of ——, personally appeared —— ——, known to me to be —— of the —— that executed the instrument and acknowledged to me that such —— executed the same.

—— ——, Notary Public for ——, Residing at ——.

STATE OF ——,
County of ——, ss:

—— ——, being first duly sworn, on oath says that he is —— of the Producer which executed the foregoing Certificate and as such is fully informed as to the matters and

facts therein set forth that he has read such Certificate and knows the contents thereof and that same is true as he verily believes.

——.

Subscribed and sworn to before me this — day of ——, 193-. ——, Notary Public for ——, residing at ——.

[fol. 162] By stipulation there were opened and identified by the Master and received in evidence as though read before him, the depositions of Robert A. Millikan, taken at New York City pursuant to stipulation, on September 5, 1931; the deposition of Irving Langmuir, taken at Schenectady, N. Y., on September 9, 1931, and the deposition of Markham Cheever, taken at New York City, on September 11, 1931, on behalf of the plaintiff.

Said depositions (reduced to narrative form) are as follows:

[fol. 163] ROBERT A. MILLIKAN, witness called on behalf of the plaintiff.

Direct examination.

By Mr. MacLane:

Residence, Pasadena, California; age 63; Director of the Norman Bridge Laboratory of Physics of the California Institute of Technology, Pasadena, California.

The major part of my activities have been in the field of electrical theory and practice. During the past ten years I have been directly engaged in research and teaching in this same field at the California Institute of Technology. My work in Physics has been recognized in a number of ways, among which I may mention the award of the Edison Medal of the American Institute of Electrical Engineers, the Faraday Medal by the London Chemical Society, and the Nobel Prize in Physics by the Nobel Prize Committee. I took my Doctor's Degree in Physics at Columbia University in 1895; then I attended the Universities of Jena and Gottingen, in Germany; and from the fall of 1896 until the fall of 1921 was engaged in research and teaching at the University of Chicago. • • •

The terms "electricity and electrical energy" are commonly used to designate a particular form of energy which has been found especially adapted for efficient transferring and for general use. Energy in this form is commonly called electricity or electrical energy, to distinguish it from energy in other familiar forms, such as heat energy, chemical energy, energy of falling water and other forms of mechanical energy.

The terms "generation", "manufacture" and "production" as applied to energy in the electrical form are merely convenient designations applied to one aspect of the process of transferring energy from some source in nature, such as falling water, for example, to some point where it may be usefully applied.

The various facilities used in the process of electrical supply are purely transferring devices. The falling water [fol. 164] pushes against the blades of a waterwheel, thus causing the shaft to revolve and with it the rotating portion of the electric generator. The power of the water is transferred mechanically along the shaft from the water-wheel to the generator continuously and essentially simultaneously with the demand upon the generator. The electric generator consists essentially of a system of conducting wires moving through a magnetic field. This process serves to transfer the mechanical energy of the motion to electrical energy in the wires. In this process of transfer of the energy from the mechanical to the electrical form, no material is required or consumed. The energy drawn from the water is merely changed from one form to another and passed along. The process through the generator is continuous and the action essentially simultaneously with the consumer's demand for energy.

There is a continuous electrical and electro-magnetic path or circuit between the windings in the generator and the windings in the consumer's motor or between the generator windings and the filament in an electric lamp or the electrodes in an electro-chemical cell. The entire electric system functions to transfer the force of the falling water to, and to apply it at, the point where it is to be utilized. Except as and during the period that energy is called for, and used at the final point of utilization, the electric generator neither receives from the water-wheel-shaft, nor delivers to the electric transmission line, any energy other than that

necessary to hold the equipment under constant rotation and electric charge in instant readiness to serve.

The entire combined process, mechanical, electrical and magnetic, is integral, continuous and essentially simultaneous, (or) instantaneous. Electricity travels approximately at the speed of light, 186,000 miles per second.

The power being transferred at any instant from the electric circuit existing between an electric generator at [fol. 165] one place and a receiving device at another place, is calculable at any point in the circuit from the electrical pressure or voltage between wires, and the magnitude and characteristics of the electric current circulating in the wires, and is commonly expressed in kilowatts.

The kilowatt or one thousand watts is a measure of electric power. It is comparable to the horsepower by which mechanical power is measured. The horsepower is the power required to lift a 550 pound weight one foot in one second of time. A kilowatt is approximately four-thirds of a horsepower, and therefore is an expression of the power required to lift 737.6 pounds one foot in a second.

A "Kilowatt hour", the usual unit for measuring energy in the electrical form, is a mathematical product of the power relation in the electrical circuit between the generator and a receiving device measured in kilowatts, and the duration of time over which that utilization is measured in hours.

It is not possible to have a measurable kilowatt hour generated except as we have that kilowatt hour used somewhere in the system attached to the generator.

It is not possible to measure a kilowatt hour at any point in the electric circuit except as, if and when electric power is already in process of transference, and as we say, flowing over the wire.

Q. Is there a relationship between kilowatts or kilowatt hours generated and kilowatts or kilowatt hours consumed by the user?

A. Yes. The two are the same, except for the intervening so-called losses in the system, which more accurately might be termed "intervening system uses."

The so-called losses represent uses in the electrical system which are incidental and necessary to its functioning in accomplishing the energy transfer process. That is to

say, the transformers use a part of the generated electrical energy; the transmission lines a part; the distribution lines, a part, and so forth, in addition to the major part used by the consumer's appliances. Thus the amount generated [fol. 166] is at all times exactly equal to the sum of all these uses for the reason that these aggregate uses are reflected directly on the generator and the generator does not, and cannot, generate electricity in excess of the aggregate uses. There is no need of measuring them separately, but the total of system uses or so-called losses is reflected in the difference between the total generated and the total used by the consumers and measured to them.

Even at unlimited cost, it is impossible to construct a system which will operate without some system use or so-called loss. There must be a point of balance between theoretical perfection and economic practicability in the design of an electrical system. Engineers consider the practical results to be accomplished, and design a system which will accomplish these results with the greatest efficiency within practical limitations of cost and operating conditions. These so-called losses or system uses are therefore inherent and intentional in the system as designed. They may be closely determined in advance under any given condition of operation upon the system as designed and constructed.

For illustration, consider the analogy of energy being transformed in the mechanical form over a long line of shafting, to supply a consumer; bearings at intervals are essential to support the shaft in a straight line. There is no practical type of bearing, however, which, in some degree, does not resist the rotation of the shaft, due to the friction or rubbing of the shaft in its bearings. At each bearing a small portion of the mechanical energy being transmitted along the shaft is used to overcome this resistance. The amount of energy being delivered for the consumer's use is less than the amount delivered to the shaft by exactly the sum of all such incidental uses or so-called transmission losses. Without supplying these so-called losses, this process of energy transfer would of course be impossible.

The transfer of electrical energy should be differentiated from the transfer of any ponderable substance like water, or gas, or coal. Losses of the kind indicated by the ques-

tion are in general due to leakage or defects in the system, [fol. 167] or in the processes. Losses in an electrical transmitting system are essentially like, indeed quite the same, as frictional losses in the bearings of a mechanical transmitting system. They appear not as leakages or breakages of ponderable substances, but merely as heat losses. That is, they are inevitable system losses or system uses, if you prefer that term.

Q. Is electricity or electrical energy stored or capable of storage in an alternating current electrical system?

A. Electricity, as such, is, I think, not storable, strictly speaking, even in a direct current system involving storage batteries, i.e., in a storage battery system. What is actually done is to transfer electrical energy into the energy of chemical separation. Later when that storage battery is "discharged", to use the term in common practice, the process is again a transfer from chemical energy into electrical energy. Even that kind of use which is sometimes called "storage" is not possible with an alternating current system, at least commercially. I know of no case in which alternating current energy can properly be said to have been stored in commercially usable amount.

Q. Since you have differentiated an alternating current system, and a direct current system, will you explain in a few words the difference between these two forms of electrical systems?

A. In most, if not all, electrical generators, the wires in which the electrical energy starts to flow pass through the magnetic field, first, in one direction, and then in the opposite direction, and consequently in the so-called generator itself, even in so-called direct current systems, it is an alternating current that is generated rather than a direct current. In so-called direct current systems, however, these alternating currents in the windings are so arranged as to be brought into contact with what we call the positive and negative terminals of the transmitting line, synchronously with the changes in direction in the generator wire, so that the current in the external circuit, is, as we say, unidirectional. That means that the one wire of the transmitting line remains always positive with respect to the other. [fol. 168] That procedure is adopted in certain instances, because for certain types of commercial use such as charg-

ing so-called storage batteries, or running so-called direct current motors, it is essential to have unidirectional currents. For such uses as electric lighting and a great multitude of uses, such a change into direct current in the line from alternating current in the generator windings, is not necessary; indeed, the majority of commercial uses at the present time utilize what we call a. c. instead of d. c. current. Alternating current differs from direct current in that the positive and negative phases change, in each element of the wire, as the current passes over it.

Q. When a consumer, in the use of an alternating current system, throws in his switch to connect his motor, does he get in response to his action electricity already generated and stored in the line?

A. No. He causes the amount of electricity represented by the demand of his motor to be generated at the generator and transmitted over the line in direct response to his demand. In this, the electrical system differs from a water main or gas pipe system with storage facilities from which the consumer may draw water, or gas, for a prolonged period from what is already in the main or pipe system. As I have already said in effect, the electrical system—that is the generators, lines and transformers—does not operate as a storage battery, but as a device for the immediate transference of energy from its source in nature to its point of use, when, as and, if the consumer required it.

Q. Assume, if you please, a power station, which we will call A, connected to a transmission line extending to a consuming device, such as a motor, which we will call B, which device uses all of the power generated by Station A. Will you illustrate what has been said before by describing the relations between the generating station and the consuming devices?

A. Other than supplying the so-called losses incident to maintaining the system under electric charge, the generator at A runs idly, except as the consuming device at B is [fol. 169] using power or electricity; and when it is so using power or electricity, the process of generation, transmission, and use, is integral in the sense of simultaneousness regardless of the distance of transmission within any presently known commercial limits; the whole system must operate essentially simultaneously, or not at all. * * *

In the commercial generation, transmission and distribution of electricity, the process is essentially unchanged. Electricity generated at different stations may for commercial convenience, reliability of service, and similar factors, be brought together at one or more distributing stations or sub-stations, as they are sometimes called, from which it is in turn distributed over different lines to the consumers' different points of use.

If no consumer is using power from any distribution line, no demand is placed on the generators, and no electricity is generated except as above stated—that necessary to hold the equipment under rotation and electric charge. If the aggregate demand of the various consuming devices of the different consumers is less than the capacity of the generators, that part of the generating equipment which is not required to serve the immediate present aggregate demands of the various consumers, remains idle, or delivers only such power or electricity as is required to meet the aggregate demands of the consumers.

Under such conditions meters placed at the generating station register the power output (subject to so-called losses or system uses) required to meet the then aggregate demands of all the consumers. They afford measurements of generation, because the two are correlative.

Except for the uses in the system, or so-called losses, such meters placed at the point of generation will not register any output in kilowatt hours or otherwise, except as the consumers at the same time are utilizing such kilowatt hours.

As to any kilowatt hour produced for barter, sale or exchange, that is for delivery to some consumer, it is not possible to measure the kilowatts or kilowatt hour generated in response to such consumers' demand except as such kilo- [fol. 170] watt hour has actually been delivered to the consumer.

Q. What is the function of "step up" transformers placed at the generating station, and "step down" transformers placed at the consumer's point of use, or some intermediate point, in the process above described?

A. The various processes involved in stepping up and stepping down voltage through transformers, involve no change in the essential nature of the electrical processes which I have previously described. They are merely de-

vices adapted to the needs of the particular situation, developed primarily with the view to efficiency and economy in operation. For illustration, electricity could be generated at 6600 volts, and economically transmitted for a distance of a few miles, and used by the consumer whose motors are operated by that voltage, without any process of voltage transformation at either end of the circuit. This would probably be done under such conditions of transmission and use; but as distances of transmission increase, transmission at such a relatively low voltage involves either excessive size of conductors or excessive losses in transmission, and the economic and practical thing to do is to step up the voltage, that is, increase the pressure, for the sake of economy in transmission. The transformers, therefore, are merely an aid to the transmission of energy in the electrical form or what we call electricity.

Q. Is there any analogy between an electrical system in generating, transmitting and delivering energy in an electrical form, and a mechanical system for the transference of energy?

A. The whole electrical system is merely a device for transferring the energy of falling water from the point at which it falls to some other point under conditions for more convenient and efficient use. In principle this transfer might be done by a water-wheel and shaft, or a pulley and belt, or any other mechanical agency for transferring energy from one point to another, as well as by an electrical system. If it were so transferred, for example, the energy [fol. 171] transmitted by the belt in a given time will be measured by the pull on the belt, its speed of travel and the total time.

Cross-examination.

By Mr. Barber:

In this transfer of energy by an electrical system, we have a transformation also from the energy in the falling water to energy in another state, which is more readily usable by the consumer or user. In other words, we might and do, by a gravity system, no pumps intervening, transfer the energy of falling water to the faucet in the housewife's sink, and she has the energy of falling water available at that point; but she can not employ it for the opera-

tion of her radio or the motor in her carpet sweeper or the operation of her electric range or the lighting system. The great amount of the mechanical work represented by motors and our modern lighting systems, such as employed in an office building, the operation of elevators, radio systems and Doctor's X-Rays are dependent in our modern day life upon this conversion from the mechanical, generally, into electrical form.

Q. Would you state that electricity or electrical energy had any material substance?

A. No. Energy is not a substance. Its dimensions are those of work which is force times distance. Perhaps the simplest illustration I can use to make these relations clear to the non-technical mind, is to say that in the ultimate analysis, electrical energy, mechanical energy and all other forms of energy, are of the nature of heat. The ordinary man knows that heat is not a substance. In this particular, electricity is precisely like heat. It is wholly convertible into heat. So is mechanical energy also convertible into heat. The analogy I want is the relation between heat and electricity, as most people think they know what heat is and do not understand electricity; but there is nothing more mysterious about electricity than about heat.

Q. Is not there some theory * * * about the composition of atoms, as made up of electrons?

[fol. 172] A. Yes. They attribute mass to the electron. The electron is the ultimate unit of electricity.

We do not notice the presence of the electron and the ion in the mechanical energy in the revolving shaft from the turbine wheel to the rotor. What we notice is simply the heat that is produced when the electrical energy becomes transformed into heat in the conductors.

Q. We might state simply that by the transfer or transformation of mechanical energy into electrical energy we have something with a new name, with different physical characteristics and adapted to new and different uses?

A. Yes. I would prefer to change the form a little bit and say that you have mechanical energy transformed into a new form of energy which is adapted better to certain types of uses than the mechanical energy was. In some instances, uses to which we are not now able to apply mechanical energy. And in others, in order to get a greater

facility or a lack of noise or odor or a more flexible control.

Q. Would you say that from a practical point of view, electrical energy is consumed by the device of the consumer?

A. Consumed in this sense, that the customer receives a certain amount of electrical energy, and as a result his appliance does the work that he wants to have done with it. And in the practical operations of an ordinary electrical system, the meter at the customer's shop or house measures the quantity or volume or amount of electric energy which he receives. Its use is determined by his desires as between one device and another. The generating station has no control over that choice between different uses at all. The user may want heat energy, as in an electrical cooker, or he may want mechanical work, and the generating system has no means of differentiating or controlling such customer's uses. • • •

In the case of alternating current, the current reverses its direction of flow in the line in the alternating system; at least, that is the way we usually describe it. Between [fol. 173] these reversals or cycles, there is a point of time at which there is no current flowing.

Q. In practical operations a generator produces only in response to a demand; but would you say that the generator was physically incapable of producing anything except when there is some demand or use either by a device or by the system itself with its incidental losses, such as grounds, etc.?

A. Yes, that is a correct statement. In an electrical system, such as a water fall, for example, so as to keep in concrete terms rather than general terms, the transfer from the falling water into electrical energy in the system can only be made when the electrical system can in some way or other dispose of that electrical energy. It might waste it all in grounds; in the useless generation of heat, but in general the energy cannot flow into an electrical system from the water fall unless some method of use of that electrical energy is provided.

Q. If the governor on a generator were jammed so as to permit the full head of water to continue to exert itself against the turbine and at the same time the wires were out between the generator and the station bus, the generator would burn itself up and destroy itself, would it not?

A. No. If the circuit were open, as I understand your question, there could be no transfer of the energy of the falling water in the electrical form except as indicated in my testimony, that small amount necessary to keep the system in electrical charge.

Q. As I understand it, the output of the generator measured in practical terms of the amount of work that it would accomplish is measurable or calculable only at the generator, and at any other point along the distribution or transmission lines you get a lesser amount because of what you have spoken of as, in popular terms, losses between the generator and such remote point of measurement? • • •

A. Yes; less by the amount of what we call the line losses [fol. 174] or the system uses. There is a greater amount of mechanical work possible at the locality of the station than there is at any remote point.

The kilowatt hour is the common unit of measurement of electrical energy. Measurement at the station between the generator and the bus would be the first practical point of measurement of the output of the generator.

The man in charge of the transmission line, by opening or closing of different switches, will render the output of a certain station available to consumers over that transmission net-work.

Q. The mere operation of the generator or the conduct of any man at that plant cannot control the route of that energy over the transmission net-work?

A. I understand that to be differentiating sharply between the man who controls the generator and the man who controls the transmission net-work, and my answer is that the control of the routing of the energy is in the transmission net-work and not in the hands of the man who is in control of the generator. The amount of energy or the percentage of the output of a plant which reaches the consumers and is put to beneficial use or employment is dependent upon the character or construction of the transmission line and of the equipment, such as transformers used in connection therewith, and upon the efficiency of maintenance and insulation and the like characteristics of the transmitting line.

In the generation of electrical energy it is given certain definite characteristics with relation to voltage and to fre-

quency. There is no one definite frequency or voltage that is essentially inherent in generation, but they depend upon the character or characteristics of the devices employed by man, represented particularly by the generator and the receiving device.

Q. We were referring to the transfer of electrical energy as likened to a transfer of mechanical energy by a water-wheel, pulley and belt. This analogy is subject to the same [fol. 175] explanation as that of the transfer of energy by taking the water itself to another point where the fall of that water would give a certain amount of energy, in that it is not adapted to use in those devices common to our office and shop and home, where we now employ electrical energy?

A. Yes. In that particular the analogy is correct. It is not complete, however, because in the case of the transfer of mechanical energy through a shaft, or pulley and belt, as in the case of the transfer of electrical energy, there is no transport of material substance. In the case of the transfer of the water through pipes to and in the point of use or to a point of use remote from the fall, there is transport of material. In those particulars the analogy would then fail.

Q. But the energy represented by or made available by the moving belt would not without a transformation from mechanical energy into electrical energy operate a radio or an X-Ray or many other devices now operated by electrical energy?

A. No, not at the receiving station.

Q. You were speaking of the practically instantaneous response of the generator to increased demands upon the system. That response comes from the automatic adjustment of the valves which control the head of water admitted to the turbine through certain mechanical devices which man has adapted to the purpose, does it not?

A. Not wholly and not instantaneously. The point I am wishing to bring out here is that when a switch is closed and the demand for electrical energy put on the line by the consumer, the energy that begins to flow practically instantaneously into his consuming device is supplied by the mechanical energy of rotation of the rotating parts during the brief instant required for the automatic valves to open, so that more energy of falling water can enter the water

wheel. In other words, this problem as I see it, has no relation to the problem of the storage of electrical energy as such in the electrical system. It is a mechanical matter. That response follows from the particular devices and mechanical design of machinery which man has adapted to gain that automatic adjustment to the increased load upon the wire.

[fol. 176] Redirect examination.

By Mr. MacLane:

Any alternating current which by definition is a current which changes direction once every half cycle, must at the instant at which the change of direction is taking place, pass at each point in the circuit through a point of time at which the current is flowing neither to right nor to left, at which there is no current. That happens in a 60 cycle system 120 times a second.

Q. In the meantime, any given quantity of electricity, if I may use such a term, such as for example a kilowatt is travelling at the rate of 186,000 miles a second, I believe you stated?

A. Approximately. In a practical system it would be a little less than that, but so little as to be negligible from our point of view.

Q. Consequently, you do not mean that that particular instantaneous kilowatt of power travelling at that rate changes its direction of flow before it gets to the consumer?

A. No.

Q. A question was asked—I cannot repeat the exact question—but your answer to the question was that under certain conditions electricity might be wasted through the useless evolution of heat. I assume that you referred there to such a condition as would exist as the result of a short circuit or some such thing?

A. To grounds or short circuits, which amount to the same thing. Whether useful or not, the electricity generated is in some way used just as at the time it is being generated. * * *

The effect of leaving the governing gates wide open so that the turbine would admit all the water which it was designed to pass through it, and the generator itself was

not connected to any transmission system or receiving device, would be to cause the generator to race until all the energy of the falling water is consumed in heat evolved in bearings, and so forth. If that were continued for an undue length of time, the generator would destroy itself through the operation of centrifugal force. Or else its bearings would get so hot that they would absorb all the energy of [fol. 177] the falling water. That would be mechanical energy so absorbed. Under such conditions, no electrical energy would be generated other than that required to charge the capacity of the system. If, on the other hand, a short circuit of sufficient intensity or magnitude should occur, the generator then might burn itself up electrically.

Q. Some reference was made to losses dependent upon use and varying with the distance of transmission. Losses of that character are purely the resistance losses of the copper or other conductor, are they not?

A. Practically so. There is a little bit of what we call electro magnetic radiation from the wires, which goes off, but it is practically all heat losses. These resistance losses vary proportionately with the demand imposed by the consumers upon the system. In addition to the resistance losses there are so-called iron or transformer losses. These losses, or uses, the iron losses, are not proportioned to the consumer's use. In a minute degree they may be dependent upon, but not proportional. To the first approximation they are independent, though not quite rigorously so. These transformer uses, or transformer losses, are incidental to keeping the magnetic field energized. They are called hysteresis losses and result in heating of the iron cores. They are part of an electrical system. And similarly, they are not in any way proportional to distance of transmission as such.

[fol. 178] Irving Langmuir, a witness on behalf of the Plaintiff, testified as follows:

Direct examination.

By Mr. MacLane:

Residence, 1176 Stratford Road, Schenectady; Age 50; Research Physicist and Chemist and Engineer, employed

by the General Electric Company as Associate Director of the Research Laboratory of that Company in experimental work in connection with the practical application of the science of electricity to the arts and industry.

I graduated from Columbia University in 1903 and then did two and one-half years post-graduate work at the University of Goettingen in Germany where I specialized in physics and mathematics and chemistry. I have been in the Research Laboratory of the General Electric Company since 1909, and the major part of my work has been concerned directly with researches on electrical problems. For many years I worked on incandescent tungsten filament lamps and then devoted most of my time for several years to the development of the present day radio tubes and many of the circuits in connection with radio receiving and transmitting sets. At the present time I am engaged largely in developing electrical devices containing gas which are being used for the control of electric power. My work for the last twenty years or more has been directly in connection with the application of scientific theories to practical electrical problems.

I have received honorary Degrees from some six or eight universities, and have received several medals, among which are the Rumford Medal given by the American Academy of Arts and Sciences; the Hughes Medal, from the Royal Society of London. I have been President of the American Institute of Radio Engineers.

Q. In this discussion which we are now going to undertake we will wish you to describe accurately and so far as possible simply, some of the problems involved in the practical utilization of energy taken from Nature. As a basis for the discussion we may require some definitions. Will you describe energy in its various forms, as that term is [fol. 179] used in physical science, and the arts dependent on it?

A. Energy is a measure of the ability to do work, and by "work" I mean mechanical work.

There are many forms of energy, for example, mechanical energy. A very familiar form of mechanical energy is kinetic energy which is the energy of a moving body which it possesses by virtue of its motion. A familiar example of this is the energy of a rapidly moving

automobile. After water is falling its energy is kinetic, but before the water has started to fall it possesses what is called "potential energy." That is, it has the ability to do work because of its position, and this may also be called "gravitational energy" because it is readily rendered available by the earth's gravitation and attraction on the water.

All of these various forms of energy, among which I must also include electrical energy, are convertible one into the other and have a tendency to ultimately go over into the form of heat energy.

One of the most important natural laws that has been discovered by mankind is known as the principle of the conservation of energy, according to which energy cannot be created nor destroyed but can merely be transformed or converted from one form to another. So the total energy in the world is constant and definite except insofar as the earth receives energy from the sun, or loses it by radiation out into space.

Practically all of our energy is fundamentally derived from the energy that we receive from the sun.

Energy may be taken from its source in nature and transmitted to the desired point of useful application, in many ways. For example, mechanical energy, either originally as potential energy or kinetic energy, may be transmitted by means of a series of belts, or by means of a rotating shaft. It can also be transmitted by means of compressed air through a pipe line, or by means of water transmitted through a pipe line, the water being under pressure and its ability to do work being dependent on the pressure in the line at the point where it is to be used. The mere pressure, however, does not transmit energy. There must also be [fol. 180] a flow of water, and the amount of energy transmitted is measured as the product of the pressure and the amount of water that flows.

Commercially, the most important method of transmitting energy, as such, is by the electrical transmission of power. However, we must also consider that commercially on a large scale power is transmitted in the form of chemical energy, as, for example, by transporting fuel such as coal on railroad lines to the point of consumption.

Also we have the large scale transmission of power by pipe lines which transmit natural gas or fuel oil.

In these cases the chemical energy which is locked up in the fuel is transmitted from its point of origin over the railroad lines, or through the pipe lines, to the point where the fuel is burned or consumed and its chemical energy is released and is converted to heat energy which may be either used directly or may be used to generate electric power.

In the transfer of energy electrically from falling water to a distant point of use the water is usually in a reservoir at a high elevation. The water is allowed to flow to a point at a lower elevation, and in so doing the potential or gravitational energy is automatically transformed into kinetic energy, which means that the water is set into rapid motion at some point along its path. At this point, a turbine is interposed whose blades receive the impact of the rapidly moving water and the kinetic energy of the water is delivered to the shaft of the turbine in the form of mechanical energy.

Connected also to this rotating shaft is an electric generator in which copper conductors are made to move across a magnetic field which is maintained in the generator by separate excitation of its field coils. This action causes electric current to flow in the conductors in the generator and not only causes the electric current to flow, but forces it to flow with a high pressure which is measured by the voltage of the current that is generated.

The power which was originally present in the water is now electrical power, but just as in the case of the flow of [fol. 181] water which I spoke of a little while ago there can be no electric power except insofar as current flows. Mere electric pressure does not produce power. There would therefore be no electric power generated unless the current from the generator is allowed to flow away from the generator through electric circuit. Ordinarily, this involves a transmission line, usually having three conductors. At the further end of the transmission line there are usually transformers which control the voltage for use in distribution to the consumers. Each consumer converts this electric energy into some other form of energy which is suitable to his needs.

For example, one consumer may wish heat for cooking, or even for house heating. Another wishes mechanical

energy which he obtains by using motors. Others may wish to use the electric energy in chemical form, or in what are called electro-chemical processes for the manufacture of various chemical substances; or he may wish to use it for the operation of a radio set, and other numerous applications with which we are familiar.

In all of these cases the electrical energy is converted into some other form of energy which the consumer desires.

Q. Then, as I understand you, the energy present in Nature at the source is not electrical energy but is another form of energy, and the energy used by the consumer, actually used and applied by the consumer at the place where he receives it is not electrical energy, but that the energy is in the electrical form only during the period of its transmittal or transmission from the generator at one end to the so-called consuming device such as motor, lamp, or similar device at the other end?

A. That is practically always true. The energy originally present in Nature is never in practical cases present as electrical energy. Man converts this energy available through Nature into electrical energy, transmits it to the consumer, and the consumer there takes the electrical energy and consumes it by converting it into some other form of useful energy.

The electric generator cannot function to produce or generate or transfer from another form into the electrical [fol. 182] form electric energy beyond that required by the electrical system itself to keep it in charge, except when, as, and if, the consumer is conversely converting the energy into some other form than electrical at his end of the circuit.

The electrical phase of this process of transferring energy from Nature to a distant point commences in the electric generator. * * * I would regard the passage of the electrical conductors across the magnetic field produced by the field coils as the factor primarily responsible for the generation of electrical power. The whole design of the generator is such as to permit this action to take place under controlled conditions.

As I said before, however, the power is generated not because the conductors pass through this magnetic field, but because the current is permitted to flow through these con-

ductors when these wires pass through the magnetic field. The power is generated only insofar as the current flows through the generator, and whether or not current flows depends upon whether power is consumed at other points in the distributing system or in the transmission line.

Q. Then this electrical phase commences definitely at some point within the generator and before the current may be said to have left the generator; is that correct?

A. Yes. Of course by "point" you mean a large fraction of the generator because the generator is pretty well filled with electric conductors.

Q. At what point does the electrical phase of the process of transferring energy end?

A. The energy is transferred over a transmission line and over a distributing system to the consumer. The whole process ends when the consumer converts this energy into some other form of energy.

Whereas the generators are usually small in number and very large in size, the consumption of the electric power takes place in enormous numbers of relatively small size units of a wide variety of types.

Q. Then would it be proper to say that the path or con- [fol. 183] duit for the transfer of electricity has its origin within the generator and is continuous from that point to a point within the consumer's motor or similar consuming device?

A. As a practical matter it is continuous from the generating station to the consumer device, although as a matter of fact, there may be interposed transformers which raise or lower the voltage along the line between these two ends. The action in these transformers, however, is electrical and constitutes practically a gearing device such as exists in the transmission line of an automobile. The action of the transformers is very much like that of the gears in the automobile which permit the engine speed and the speed of the wheels to be varied in any definite ratio which may be desired.

There is no interruption, by reason of these transformers, of the continuity of the flow of the electrical power. The current, however, that comes in one end of a transformer is kept separate from the current which goes out of the other end, the secondary end of the transformer, but

the electric power flows continuously through the transformer, and that power is what the consumer gets.

Q. Is there any point between the commencement of the electrical phase of the transfer of energy in this form and its end that the process of transference may be interrupted without destroying it entirely?

A. No it cannot be interrupted for more than a few thousandths of a second without destroying the whole operation of the transmitting system.

Q. And in the transmission system, as you used the term in the last answer, you included the generating station and consuming device?

A. Yes—as distinguished from what is technically called the transmission line.

Q. Can any part of this electrical process function independently. That is, can the generator function independent of the consumer's motor or other consuming device?

A. No, they are inherently and essentially dependent on one another just as though they were geared together. [fol. 184] * * * The velocity with which electric power is transmitted along a transmission line is practically the same as the velocity of light, which is one hundred and eighty-six thousand miles per second. That is, the transmission from all practical points of view must be considered as instantaneous, so that the generation and consumption of power occur simultaneously.

Q. Does the electrical system itself utilize any part of what we commonly refer to as the generated electricity?

A. Yes. In order to maintain the whole electrical system in operating condition, it is necessary, for example, that the field coils of the generator shall be continuously excited. That is, the magnetic field in the generator must be maintained even if no current is generated or no electrical power is generated by the generator itself. Similarly, the action of the transformer requires that the iron of the transformer shall be magnetized.

To maintain these magnetic fields requires the expenditure of a certain amount of energy, a relatively small fraction to the whole energy which is transmitted or generated.

In a similar way to transmit electrical power over a transmission line requires the expenditure of a certain amount of electrical energy. There is, so to speak, a cer-

tain electrical friction when a current passes through a wire. In order to maintain the flow of current, it is therefore necessary to have a certain electrical pressure to maintain this flow. This involves the expenditure of a certain amount of electrical power. This is really the use of electrical power for the purpose of transmitting the power over the line. It is usually referred to as a loss because it cannot be charged for by the power company. It should, however, really be regarded not as a loss but as the expenditure of electrical energy for the purpose of transmitting power over the line.

It is entirely analogous to the coal that would be consumed in a locomotive of a train which hauls coal from a mine to a distant point where the coal is consumed. The coal in the locomotive must be expended for the purpose of transporting the larger amount of coal carried by the [fol. 185] train.

So in an electrical line a certain fraction of electrical power must be expended in order to transfer or transmit the larger amount of useful power to the further end of the transmission line.

The word "losses" as commonly used in electric station parlance to describe these uses which I have referred to, connotes commercial loss rather than loss in a physical sense. In no sense is there a useless loss of power. That is, the power doesn't leak out of the line or is not lost the way water would be lost that leaks out of a pipe line. It is not a material substance that is lost. It is merely the voltage or pressure that is lost and that is used in transmitting the power.

Q. Just very briefly what is meant by direct current or a DC system, and alternating current, or an AC system?

A. When the copper conductors in the generator rotate through the magnetic field they first pass through a magnetic field having one direction, and then as they move further in their rotation they pass through a second field having the opposite direction. They do this periodically as the shaft of the generator rotates. The result is that the electrical pressure which is produced by the generator and which is measured in volts, first tends to force the current in one direction and then immediately afterwards reverses

its direction so as to tend to force the current in the opposite direction. This action takes place, as I said, periodically and, in the alternating current ordinarily used in practice, takes place sixty times per second. That is, the complete cycle consists of a pulse of current in one direction followed by an equal pulse in the opposite direction, a period of one-one hundred and twentieth of a second elapsing between the peaks of these two pulses.

If the generator is connected up directly with the transmission line or with the transformers that fit into the transmission line, the current that is generated is thus an alternating current. It consists of a series of pulses or waves alternating in direction.

For some applications of electric power it is undesirable [fol. 186] to have these reversals in the direction of the current occur. In that case a special device is used with the generator called a commutator to take out the pulses of current that occur in one of the two directions and to reverse their direction, with the result that the flow of current now takes place in the line coming from the generator all in one direction. This is called a direct current. Instead of having a commutator on the generator, it is possible to convert alternating current at any point in the distributing system by using what is called a rectifier. Many systems of electrification of railroads involve the use of these rectifiers so that direct current can be transmitted over the trolley to the moving train.

Q. Has the alternation of direction of flow of current in alternating current systems got anything to do with the direction of the flow of power from generator to consumer?

A. No. These alternations that I speak of are not alternations along the line, but are simply alternations in time. That is, at any one place at successive time intervals the magnitude of the voltage changes from a positive to a negative flow, but there is no direction involved in either the voltage or the character of the alternating current.

I said some time ago that it is customary to use three wires on a transmission line. This is done for the purpose of transmitting three-phase current. When this is done the flow of power is steady and continuous; that is, if the devices used by the consumer are capable of consuming a steady flow of power. Any one of the three wires carries

current which first flows in one direction, rises gradually to a maximum, falls to zero, reverses in direction, passes through a maximum in that second direction and again decreases to zero, this whole action occurring in one sixtieth of a second. At certain instants of time the current through any one of the conductors thus falls to zero. However, the three wires are used in such a way that just as the current transmitted over one wire falls to zero, the other two wires are carrying a maximum current. The net result is that the sum of the three currents carried over the three wires always balances exactly. That is, the current flowing on two of the wires just balances the current flowing [Vol. 187] on the third wire. The flow of current and the flow of power are thus steady and continuous taken over the three wires considered together. The consumer gets both current and power, but the current is simply a means of carrying the power. What he wants is power.

The flow of power is uni-direction in an AC as well as a DC system.

The ordinary commercial system for the generation, transmission, and delivery of electricity in use today is an AC system, and only in special instances such as for the running of elevators, or in some cases street cars, and a few other special uses is direct current applied.

Q. Can electricity or electrical energy be stored from an alternating current system?

A. No. There is no practical way to store any appreciable amount of electrical power in an A. C. system.

Storage batteries are charged with direct current and the power of the direct current is transformed into chemical energy which later can be converted by the storage back into direct current electrical energy.

Even in such cases there really is not a storage of electricity in any true sense. This is a storage of power, but not electrical power.

In electrical systems there may be a minute amount of electrical energy stored in the form of magnetic fields in the transformers and generators and the magnetic fields around the conductors, on the transmission lines, and, in some cases capacitators may be used which are capable of storing relatively small amounts of energy. The total amount of energy stored in this way, however, would only

be sufficient to keep the system in operation for a few thousandths of a second, usually much less than one-one hundredth of a second.

Q. When a consumer from an alternating current electrical system demands the delivery of electric energy or power by pushing a button or throwing a switch, is the power or energy which is instantly delivered to him in response to his action power or energy stored in the system, or is it not?

[fol. 188] A. No. When he closes the switch, the current and power that flow as a result through the device that he thus connects are immediately drawn from the generator. That is, any current which he draws from the line causes an immediate and simultaneous increase in the current delivered by the generator, and this in turn causes more water to flow to the generator. This action is entirely automatic. In fact, the successful operation of a power station and the maintenance of constant frequency require that the rate of rotation of the generator shaft shall be kept absolutely constant. When more power is drawn and thus more current flows through the generator, the tendency would be to slow down the generator. This must be automatically prevented by a governor which allows a greater flow of water to maintain a constant speed of rotation. This, however, necessarily means that more power is drawn from the potential energy of the water in the reservoir in direct response to the power consumed. * * *

Electrical power is ordinarily measured in kilowatts.

With the direct current the fundamental unit of power is the watt, which is one one-thousandth of a kilowatt. The power in watts is simply the product of the current measured in amperes and the pressure measured in volts. This illustrates the fact which I have mentioned before that no power can flow unless current flows, but the amount of power that flows when any given current flows is proportional to the pressure or voltage. In other words, it is the product of these two quantities.

Similarly, with alternating current, power is proportional to the current and the voltage, but in this case there is a factor which is usually called the power factor, which is less than unity, which is needed to allow for the fact that the current and the voltage do not necessarily follow one

another exactly. That is, there may be a slight time lag between the two. The main point, however, is that again the flow of power is proportional to the product of the current and the voltage.

Since the kilowatt is a measure of power it is equivalent [fol. 189] to mechanical power which is usually measured in horsepower. I say "equivalent" in the sense that one can be converted into the other. However, the units are somewhat different so that actually a kilowatt is equivalent to about one and one-third horsepower of mechanical energy.

Power measures the rate of doing work. Naturally, a consumer must pay not for the rate at which it does work but the total amount of work done. That is, the longer the time interval during which power is consumed, the greater amount he must pay. Therefore, as a practical unit of charge to measure the energy consumed, the kilowatt hour is adopted. If one kilowatt is consumed for one hour, this means that one kilowatt hour has been consumed. Or we might have one-half kilowatt for two hours, which would also be one kilowatt hour. In other words, the kilowatt hours represent the product of the time by the kilowatts.

You cannot measure a kilowatt hour at the generator or anywhere else upon the system except if, as, and when that kilowatt hour is delivered to and used by the consumer.

Q. Of course in this sense to be complete, meters at the generator will show the so-called output of such power as is required to keep the system in rotation and under charge?

A. Yes. At the generator the meters which measure kilowatt hours would show the total kilowatt hours consumed in the entire lines which would include the so-called losses along the line. But so far as kilowatt hours generated in response to consumers' demands are concerned they can be measured only if, as, and when they are actually demanded and consumed. The measurement is in kilowatt hours and that involves the measurement of current in amperes, voltage and time. It is the product of these three that determines the power consumed.

As I said before, no current can flow in one part of the system without involving current flow through other parts of the system. The recording of the kilowatt hours on the meter at the generator station is thus simultaneous with the consumption of the power at the other points along the

line beyond the generating station. This is necessarily [fol. 190] the case because there is no storage of electricity.

The case is quite different from what it would be if you were measuring the flow of oil or water or coal which was being transported or transmitted for power purposes. In that case the amount of material passing a given point is not necessarily the same as that which is consumed at other points because there may be and usually is a very great storage of material along the way. The electrical system is much more closely related to the system of belts or transmission of power along a shaft where the input and output are inherently tied together. For example, the transmission shaft of the automobile is quite similar in this respect to that of an electrical transmitting system. If an automobile comes to a hill so that more work is required to turn the wheels and push the automobile up the hill, immediately and necessarily more power must be consumed or must be produced by the engine if the speed is to be maintained constant. The essential point of similarity in this case is that there is no energy stored anywhere along a transmission shaft between the engine and the wheels and therefore there is an immediate response between the power consumed and the power generated, just as there is in the electrical transmission system.

Q. While the results accomplished are somewhat different, what is the difference in principle between generation, transmission, and delivery of electric power and energy and the initiation, communication, and reception of telephone or telegraph messages.

A. I should say that there is a close similarity between these two systems. The generation and consumption of power are processes that are simultaneous and inherently dependent on one another. This is quite analagous to the action that occurs in a telephone line between the transmitting and receiving end. In the telephone line we have the energy of the sound waves in the air that are converted into electrical power which is transmitted over the telephone line to the receiving station, the receiving telephone, where it is again transformed into the energy of the sound waves which are suitable for producing the desired effect on the ear of the listener.

We know that in this case the enormous speed with which [fol. 191] electrical impulses can be transmitted over wires makes the action between the receiving and transmitting ends simultaneous and inter-dependent.

In cases like this we see clearly that the character of the electrical system, by which it did not store energy, is of the utmost importance and differentiates this system from one in which energy storage might occur. If energy storage does occur, the time lag that would ensue between the action at the transmitting and receiving ends would interfere seriously with the transmission of speech.

In our power transmission lines we have this same characteristic, that the inter-linking of the generation and the consumption is rapid and practically complete.

Q. Is there a similar analogy between a power system and radio system consisting of the broadcasting devices at one end and the receiving set at the other?

A. Yes. The radio set is practically like the telephone transmitting system that we have just discussed, except for the additional radio link. That is, in the radio system the sound waves are transformed into electrical energy which is an alternating current having the same frequency of vibration as the sound waves. Then instead of transmitting this alternating current directly to the receiving end, it is transformed into radio waves which are sent out by a broadcasting station and these propagate through space to the receiving antennae. From there they come to the radio receiving set and are converted into alternating currents which act on a loud speaker in order to produce sound waves again. Between the microphone at the studio of the broadcasting station and the loud speaker in the home of the listener the action is wholly electrical and is similar to the power transmission system in regard to the velocity of propagation.

There is one distinct difference, however, between a radio broadcasting system and that of the power generation system in that the broadcasting station sends out into space a perfectly fixed and definite amount of energy regardless of whether the listener operates his receiving set or not. The energy sent out by the broadcasting station is dis- [fol. 192] sipated in space and only a minute fraction of it comes to the receiving set of the listener. The receiving

set then takes this minute amount of energy and by means of vacuum tube amplifiers builds up the energy back to the point where it is sufficient to operate that loud speaker.

In our power transmission system, however, the connection between the consumer and the generating station is almost infinitely more intimate than in the case of the radio broadcasting station. In the case of the radio station the losses are very much greater than the amount of power actually transmitted to the receiving system.

Q. Just one or two practical applications and I am through. Assume that a power station is located in one State, that a transmission line extends directly from that station across the State line into another State, and that at the terminus of that transmission line there is a consumer who uses the power output of the station. Can any power be generated by that station in the first State other than again is required to keep the system under rotation and in charge except in response to and simultaneous with a demand and use by the consumer in the second State?

A. No. And that is true whether there be in the second State one consumer or many thousand.

The amount of power generated by the station in the first State is always equal to the amount consumed by the consumers in the second State, again allowing for the so-called system uses.

It is not possible to measure a kilowatt hour of electricity or electrical energy at the generating station in the first State except, if, as, and when that kilowatt hour is also passing over that State line and being delivered to and used by the consumer in the second State.

Cross-examination.

By Mr. Barber:

Q. With reference to the analogy between the electrical transmission system for power, for instance, and telephone [fol. 193] or telegraph and radio, we have this practical difference, that in the one, the power system, we are transmitting energy and ability to do work, and in the other intelligence; that is, ideas or thoughts?

A. Either or both. It is only by means of the transmission of energy that you are able to get the thoughts across.

Q. Yes, but the user of the radio receiving set, or the receiver of a telegram, gets only the thoughts that are initiated at the sending station, while the customer and the user of the ordinary electric power system gets an ability to do work which he can utilize as he pleases as between one device and another, or to a slight or greater extent?

A. The electrical transmission of power gives a system of the utmost flexibility suitable for many different applications, whereas these other systems that you have mentioned are highly specialized, adapted for only a particular kind of use. In those cases where you say intelligence is to be transmitted, the efficiency of the power transferred becomes of minor importance, but it is only by the transmission of power that the intelligence can be transmitted because it is this electrical power which is converted into the sound waves which affect the ear of the listener.

Q. You distinguish sharply between electrical energy and energy in other forms with regard to the uses to which it may be applied by the consumer and the devices with which its use may be had, do you not?

A. Any sharp distinction depends upon what points of similarity or dis-similarity we wish to emphasize. In some ways they are essentially alike, and in other ways they are essentially different.

Q. You do not confuse the two in your mind. May I state that question this way: The same amount of energy may be transferred by a system of belts and pulleys, but before a consumer can use that in the devices which he has in his shop or home, it must first be transformed into electrical energy?

A. Not if he wants to use it as mechanical energy.

[fol. 194] Q. I should have referred to the lights, the electric range, and electric motors, and such other electrical devices as are now commonly employed for the use of electrical energy?

A. Yes that is true then.

It is generally true that for a great many uses or purposes electrical energy may be more readily applied, or a device may be operated with greater facility or control than would be possible with mechanical energy.

Q. At what point in the electrical system would you say the output of the generator might be practically measured?

A. Preferably close to the generator, and in any case naturally preferably before the power has been sub-divided into a large number of smaller units as in a distributing system. If you measure it close to the generator a single set of measuring instruments will suffice to measure the power, whereas if it is placed further away where the line is sub-divided it may be necessary to add the power consumed in each part of the system in order to obtain the total and it may then be necessary to add in also the power consumed in the distributing system itself. But necessarily that point of measurement must be after the power has left the generator.

Q. You spoke generally of the analogy between the dependency and connection of the generator and the consuming device and the gearing of mechanical devices. It is true, however, is it not that the generator is not dependent upon any one consuming device connected with the transmission net-work?

A. Well if there are many of them working on the same net-work it is dependent upon them altogether, but dependent on them individually only insofar as they are part of the whole.

Q. In other words, in a transmission net-work covering a considerable territory and to which a great number of devices are or may be connected, switches are opened and closed, and at one moment devices at one point are taking the output of the generator and at another moment perhaps devices many miles distant are taking that output, is that not true?

[fol. 195] A. It is true to some extent. That is, in many cases the average power consumed by a large number of small consumers may remain fairly steady even though the power consumed by the individuals is transient and be of an irregular nature. However, this smoothing out of the load by averaging is a very imperfect process and it is well known that one of the most serious problems of practically all power systems is the fact that this averaging is very incomplete and that the consumers use far more power during certain hours of the day than during other hours. It is this peak load when the larger number of consumers are taking power that makes it necessary for the power company to install far more generating equipment and

transmitting equipment than would be necessary if this averaging process that you refer to really averaged out the load to a steady flow, and by "far more" I mean several times more.

Q. Assuming more than one generating plant or station connected to a transmission net-work, the points of use of the energy from a specific station is in the control of the operations of the transmsision net-work, is it not?

* * * * * * *

A. If several generating stations are connected to a single net-work, the condition is usually then that the total power consumed by all the consumers connected with the net-work is not controllable by anyone connected with the power company; that the power company is to stand ready to deliver whatever power may be required of it.

It is possible, however, at any given time, at least when the peak load is not being consumed, to draw the power that is required from the net-work in varying proportions from the various generating stations. That is, if at any given time one hundred thousand kilowatts are needed from the distributing system and there are two generating stations available, they may draw fifty thousand kilowatts from each of these two stations, or they may decide to draw seventy-five thousand from one, and twenty-five thousand from the other. Usually, however, when the peak load is reached it is necessary to call upon all of the generating station- together in order to maintain the system in operating condition. In that case they have no choice of distributing the load between the various generating [fol. 196] stations.

Q. With regard to the practically instantaneous response of the generator to an increased load upon the wires, can you explain why that with a substantial and sudden increase in that load, lights which were burning at the time of increase being exerted dimmed for an instant?

A. If a relatively large amount of power is suddenly drawn from a certain part of the distributing system, an increased current is drawn through the conductors of that part of the distributing system, and these, in turn, draw more current from the transmission lines that feed into them. To cause this increased current to flow through the

conductors will require a somewhat greater voltage along the copper conductors and since the generating station usually generates a practically fixed voltage, this increase in voltage along the line will mean a decreased voltage at the terminal of the line.

Usually, special devices are introduced along the line in a distributing system, particularly to compensate for this effect and to bring the voltage back as quickly as possible to its normal flow. Such regulating devices are not necessarily instantaneous in their action, but may require a fraction of a second to operate.

If an extremely large amount of power were suddenly drawn so that it represented a considerable fraction of the total power generated, the increased current which would be immediately drawn by the generator might slow down the generator slightly until such time as the governor or governing mechanism of the generator is able to increase the flow of water in the turbine feeding the generator.

These time lags are primarily dependent upon the character of the regulating apparatus used in the generator, transmission line, and distributing systems, and are not the result of the storage of energy in the transmission system itself.

I spoke of the fact of a sudden increase in the demand of power on the generator affecting the speed of the generator. The large kinetic energy of the rotating parts of the gen- [fol. 197] erator which act like a fly wheel tend to maintain constant speed of rotation for short intervals of time before the regulating devices have come into action. But, of course, the steadying effect of this kinetic energy on the rotating parts is limited in magnitude and, therefore, may not always function perfectly in case a very large amount of power is suddenly drawn.

Q. With regard to the so-called system uses, sometimes referred to as "system losses" these, as I understand it, are inherent in the operation of the system, but not all of them essential to its operation, is that not true? I refer particularly to such losses as arise from faulty insulation.

A. Well, those that are essential I do consider inherent. It seems to me that your use of these words is contrary to the ordinary use.

Besides the drop in voltage along the line required to force the current to flow, there may be power loss or power

consumed through defects in the system. However, I think that these losses, which may more properly be called losses, are negligible in amount and are not at all inherent; at least, not in appreciable amount.

In general the percentage of power generated by a station which is built to supply the power for the consuming devices of customers is dependent upon the character of construction of the transmission network and distribution network and the efficiency of its maintenance.

Redirect examination.

By Mr. MacLane:

Q. Doctor Langmuir, this momentary flicker of lights to which counsel has referred is due altogether, is it not, to a drop of voltage or pressure at the point of use rather than to other cause?

A. The immediate cause of the dimming of the lights is a decrease in the voltage at the point where the light is connected, but the loss of voltage itself of course is caused by those causes such as I have already mentioned.

[fol. 198] Q. In ordinary operation of a well constructed and adequate system, is that due to local causes in what I might term the consumers' part of the system; that is, the part that is on his side of the transformer which is immediately serving him, or is it represented by a corresponding drop in voltage in the system as a whole?

A. Oh, in practically all cases it is due to a drop in voltage along the lines owned by the consumer himself. For example, I know that in my own house when my refrigerator goes on and off there is a momentary change in the brightness of the lamps in the house, but I never have been able to observe any effects caused by the refrigerators in my neighbors' houses. This fact that I have observed I am sure is due to drop in voltage within my own house and the leads running from there to the street.

Q. Now with respect to the delivery of power in a commercial system consisting of generating stations, transmission lines, and distributing system, having furnished the facilities and placed them under electrical charge, what has the company which furnishes the power got further to do with deliveries to the consumer?

A. The responsibility of the producer of power involves the maintenance of reasonably constant voltage and frequency at the point of connection with the consumers' circuits. To guarantee that this can be done involves the maintenance of generating, transmitting, and distributing equipment sufficient to meet the maximum demand which a consumer may require. That is, the power producing company must maintain constant voltage and frequency if and when the consumer draws the maximum amount of power that he is permitted to draw under the agreement with the company.

To summarize, the company maintains installed capacity at the generators and elsewhere in the system, voltage, and frequency in its circuits, and the consumer does the rest.

[fol. 199] MARKHAM CHEEVER, a witness called on behalf of the plaintiff, testified:

Direct examination.

By Mr. MacLane:

I reside in New York City; I am 51 years old; I am a Vice-President of the American & Foreign Power Company, with headquarters in New York City, and having general charge of the electrical developments of the subsidiary companies of the American & Foreign Power Company; I am an Electrical Engineer by profession; I graduated from the University of Michigan in Mechanical and Electrical Engineering in 1903, and since that time I have been continuously engaged in the design, construction, operation and supervision of electric power properties.

I am familiar with the properties of the Utah Power & Light Company, the plaintiff in this case. One of the principal companies, predecessor to the Utah Power & Light Company, was the Telluride Power Company, which operated originally in Colorado and Utah. I was employed by the Telluride Power Company in 1906, and my first position was that of Construction Engineer in charge of the building of a hydro-electric power plant at Ames, in Southwestern Colorado. Upon the completion of the Ames plant in July, 1907, I was transferred to Grace, Idaho, where the

Telluride Power Company was commencing the construction of the first power plant upon Bear River, in Idaho. I was located at Grace during the heavy part of the construction, and was then made Assistant Chief Engineer of the Company, having contact with all of its properties. The Chief Engineer at that time was Mr. P. N. Nunn. I remained in that position until the Utah Power & Light Company was formed in 1912, and the property of the Telluride Power Company was transferred to it. I then became Chief Engineer of the Utah Power & Light Company. A few years later the duties of General Superintendent in charge of operation were added to those of Chief Engineer, and I remained in that position until the early part of 1926.

The properties of Telluride Power Company at the time they were taken over by Utah Power & Light Company consisted briefly of a comparatively small hydro-electric system in Southwestern Colorado, supplying the Telluride Mining [fol. 200] District and a more extensive system in Utah, extending from the Eureka Mining District, on the south, to Logan, Utah, just south of the Idaho state line, on the north. This Utah system was supplied principally by power plants in Provo and Logan Canyons, in Utah, and by the Grace plant, in Idaho, through two 44,000 volt transmission lines extending southerly from Grace to Logan, Utah.

The Telluride Power Company constructed the Grace plant solely to serve its customers in Utah. The Company at the time that construction was undertaken in 1907 had no business or customers in Idaho and did not contemplate having any at that time.

When the Grace plant was placed in operation, power was all transmitted to the company's system in Utah. This transmission was direct. There were at that time no uses of that power in Idaho other than those within the company's system itself, within the Grace Power Station, and also the necessary uses for charging the line and keeping the machine running at full speed.

In 1912 and during the subsequent two or two and a half years the Utah Power & Light Company acquired a number of other properties in addition to those of the Telluride Power Company, and shortly afterward extended service southward in Utah to the coal fields of Utah; so that early in its history the Utah Power & Light Company rendered

service throughout the thickly settled and industrial part of North Central Utah, and its system contained practically all of the power plants in that territory. There were thus acquired in Utah approximately 20 plants.

Some systems and plants were also acquired in Idaho. The principal acquisitions consisted of the small system in Bear Lake Valley, serving Montpelier and Paris, and also the system in Upper Snake River Valley, extending from Idaho Falls to St. Anthony. The system in Bear Lake Valley was approximately 40 miles from the Grace plant. At the time of such acquisition there was no inter-connecting electric line between Grace and the Bear Lake Valley system. The Idaho Falls system was nearly 100 miles from the Grace plant by the usual travelled route. There was no electrical connection between the Grace plant and this Idaho Falls system.

[fol. 201] When the Utah Power & Light Company acquired the properties in Utah, practically all of the important water power sites had been developed within the territory in Utah which the company served, and there were no other sites within its territory in Utah susceptible of development to supply the amounts of power which the market required. It therefore made a very definite plan to construct additional power plants upon the Bear River in Idaho, to meet the growing load in Utah when and as the requirements developed. * * *

Shortly after the formation of the Utah Power & Light Company, and early in 1913, the company commenced a substantial enlargement of the Grace Power plant in Idaho, and the construction of a new power plant at Oneida, Idaho. The Oneida development consists of three large units, and these were brought in in different years as the Utah load required such capacity. In the year 1917, a new power plant was constructed at Cove, immediately below the Grace Power plant. In 1922, additional capacity was installed at the Grace plant, and in 1924 the Soda plant, above Grace was completed and placed in operation. The aggregate installed capacity of the Bear River plants in Idaho when I left the company in 1926 was 95,500 kilowatts.

These plants were connected with the company's system serving customers in Utah by three 130,000 volt circuits extending to a terminal sub-station a few miles west of Salt

Lake City. At terminal sub-station, connection was made to the various 44,000 volt lines constituting the transmission net work in Utah. There is also a direct connection at 130,000 volts from the terminal sub-station to the Utah Copper Company sub-station, at Garfield, Utah, where the Utah Copper Company is served through 130,000 volt circuits extending from terminal to Garfield. This company is a very large consumer of the Utah Power & Light Company. During my time in Utah, they took as high as approximately 37,000 killowatts. * * *

No taps or connections of any kind were made from the 130,000 volt lines for Idaho service.

The plants on the Bear River system have been connected with the company's local systems for local service in Idaho. [fol. 202] Prior to such connection, service was being rendered in Bear Lake Valley to Montpelier, Paris and some small villages. Also, the system in the Upper Snake River Valley, extending from Idaho Falls to St. Anthony, was supplied by power plants located at Idaho Falls to St. Anthony. There were a few small villages such as McCammon and Downey, which were supplied from local plants in those towns. The plants which served these communities from these local systems, were, generally speaking, adequate to the then demands of those communities for service.

Early in 1913, the Utah Power & Light Company commenced the construction of a 44,000 volt line from Grace station to Bear Lake, for the purpose of initially operating dredges used in the construction of the Bear Lake reservoir, and later for operating the company's pumping plant at Bear Lake. Interconnection was made between this line and the system serving Bear Lake Valley. Also, some years later, inter-connection was made between Grace station and the Idaho Falls system, by way of the Portneuf River. This line enabled the connection of the system at McCammon and Downey. Also there were some small villages in the Bear River Valley near the various power plants which were, as time went on, connected.

Q. What was the direction of the flow of power generally over the line connecting the Grace plant with the Idaho Falls system?

A. Excepting during emergency conditions, the flow of power generally was into Grace station from Idaho Falls, rather than out of Grace station toward Idaho Falls.

During the period of my connection with the Utah Power & Light Company, the amount of energy supplied to the company's system in Idaho from the Bear River plants, in Idaho, never in any year exceeded 2 per cent., and was considerably less in many years.

Q. Summarizing your testimony on this subject, for what purpose were the Idaho plants of the Bear River System constructed, operated and maintained, during your service with the Utah Power & Light Company?

A. The purpose of constructing the plants of the Bear [fol. 203] River system in Idaho was solely to serve the Utah consumers of the company. Had it not been for such Utah market, the company would not have built any of the Bear River plants for service in Idaho, because the Bear River power sites were too large for the requirements of its Idaho territory. Of course, after service was available from Bear River plants, the obviously logical thing to do was to inter-connect with the system serving Idaho for the purpose of insuring reliability of service to its Idaho consumers, and for the purpose of making utilization in Utah of surplus energy which at various times might be available from Idaho system plants in excess of Idaho requirements. As I have stated above previously, the total of such service to Idaho system of the Utah Power & Light Company from Bear River system never exceeded 2 per cent of the total energy output of the Bear River System. Over 98 per cent was transmitted to terminal sub-station in Utah for use of Utah consumers. By surplus energy in its Idaho plants, I mean solely those plants at Idaho Falls, St. Anthony, and Ashton, upon the Idaho Falls system, and the plant at Paris, upon the Bear Lake Valley system, which originally served the small isolated systems, and which energy would have been useless without inter-connection.

Q. Will you describe briefly the operation of this Bear River system with respect to the supply of electric energy to supply the demands of Utah customers?

A. In general terms, water power plants are of two kinds: Those upon regulated streams, and those upon unregulated or uncontrolled streams. In general, the power

plants in Utah were upon unregulated streams. Furthermore, in the aggregate their capacity is far less than the requirements of the Utah system. The Utah system consists primarily of a net work of 44,000 volt lines centering about the terminal sub-station to which I have referred previously. The Utah Power plants are connected to this 44,000 volt system and service is rendered to consumers from such system, either directly at 44,000 volts or at lower voltages. Because of the fact that Utah plants are upon unregulated streams, they are operated at constant output at any time, and the immediate demands created by load [fol. 204] changes are met from the Bear River system. Since the 44,000 volt lines of Utah all center about Terminal sub-station and Terminal sub-station is also the terminal point of the 130,000 volt lines from Bear River plants in Idaho, as far as the Bear River system is concerned the practical effect is that of a single consumer located at terminal sub-station, whose demands are instantly met from Bear River plants. These Bear River plants are all located in Idaho excepting Cutler, the lowest one on the stream, which is in Utah. Terminal sub-station does not in fact consume the power which comes over the Bear River system. It is merely the point at which the combined effect of Utah consumers is reflected in their consolidated demand upon the Bear River system. At no time under operating conditions in Utah were the Utah plants adequate to supply the Utah load.

Q. What are the functions of the so-called Dispatcher at terminal with respect to the transfer of power from the plants, and in particular, the Bear River plants, to the consumer or consumers?

A. To be ready for consumers' demands, the Dispatcher can see and insure that there are sufficient machines rotating to meet the probable demand at any time. His duty also is to see that the speed of the system is correct, namely, at 60 cycles per second; also that the voltage is correct for delivery to consumers. At the moment, however, of the incidence of load, he has no control whatsoever. The process of transference of energy from generating stations to the consumers, occurs automatically and instantaneously, and he can in no way control that at the moment of its occurrence other than open the switch and to direct the cut-off of all

service to the consumer. After the load change has occurred, the Dispatcher again insures that the system is operating at frequency and voltage, and he may desire to transfer load from one station to another, but he cannot change the total amount of load. It is entirely beyond his power to do so other than to completely interrupt service to one or more consumers. The Dispatcher transfers load from one station to another through the medium of so-called automatic governors which control the turbine gates; he simultaneously [fol. 205] closes the gates of one turbine and opens those of another, i. e., he directs the station operators. The thing occurs automatically and instantaneously.

Q. I do not want to imply an answer that is incorrect, but in order to see whether I understand you correctly, I ask whether this is an illustration: If, in fact, this combined demand or aggregate of all consumers' demands was being reflected upon both the Oneida station and the Grace station at the same time, and in fact the Grace station was of capacity sufficient under its conditions of installed capacity and water existing at the time to carry the entire load, the Dispatcher could notify the Oneida operator to close his gates, and then the load would be automatically transferred to Grace; is that the thought?

A. That is true after the change in load has occurred, but at the moment of incidence of load, he has no control whatsoever; the machines automatically supply the power needed instantaneously. It is this: As if all the generators were one generator. This matter of load between generating stations and between units is incidental. They act together as a generator supplying the demand, and that occurs instantaneously.

Neither the step-up transformers at the station or the step-down transformers at terminal affect or interrupt the continuous flow of power. Transformers are devices used for the purpose of changing the voltage and permitting economic transmission of power and energy. They are not inherently necessary. Their use is one of economic convenience. In an electrical system, the interposition of transformers makes two or more complete circuits for the flow of current. These various circuits are rigidly interlinked at transformers with magnetic fields so that while the current circulates in various individual circuits, the flow of

power is continuous, direct and immediate. A mechanical analogy might be that of transmission through belts and pulleys. We might transmit power from a water-wheel to a point of use solely by one belt which would constitute the comparison of the transmission without transformers, or we might, for practical convenience, interpose one or more countershafts with pulleys of different sizes, and using two [fol. 206] or more belts, to accomplish the transmission between the water-wheel and the point of use. In this case the belts do not touch each other, just as the electrical system with transformers contains several paths for the flow of current, but the flow of power between the water-wheel and the point of use is instantaneous, unbroken, and direct, whether we use a single belt or a series of belts. A transformer may be likened to the gearing of an automobile. The shaft is discontinuous at the gearing but the flow of power is constant and uninterrupted. * * *

The ordinary unit of measurement of electrical current is the ampere. The common unit for the measurement of power is the kilowatt, which is the product of current and electrical pressure or voltage. The kilowatt hour is the commonly used unit for the measurement of electrical energy. It is the product of the kilowatt multiplied by the time in hours during which the power acts.

The consumer gets and uses, speaking in electrical terms, power not current.

Cross-examination.

By Mr. Barber:

The consumer gets, in practical effect at least, the amount of energy that will do a certain amount of work. In common commercial uses, we use the kilowatt hour as the unit of measurement which is power applied through a unit of time. He could take two hours to get a kilowatt hour of energy, or he may get a great many in a moment, depending on his load.

Additional capacity installed in plants means the installation of additional generators and at the Grace station that means an additional pipe line and all the other facilities that go with it for getting more water there. Each of these stations have more than one generator. The output of the various generators in the stations are gathered

together at the station bus. It may or may not consolidate there and go out over the wires as a single current. That is not essential to the process. Whether the various transmission circuits are all tied together or not is not material to the transmission of power. There may be more than [fol. 207] one transmission line and they may not be tied together at the generating end. That is not material to the process. They usually take their power from the station bus really rather than from different generators, although in modern operation we frequently connect through from large generators directly through the transmission line, but that again is a matter merely of mechanics of the process.

Steam power can be used in place of water power for the generation of electricity. The question of choice between them is merely a matter of economic factors that would enter into a particular situation.

There is a greater amount of electrical energy available for mechanical work or other purposes at the station than at any distance therefrom, the difference being the consumption of energy in the system itself in keeping it live and active.

Q. And while not proportional to the length of the system it will increase with the length of the transmission and distribution lines?

A. No, that is not true. That is a question of economic design. Length of transmission does not necessarily mean geater losses or greater system uses. That is a matter of the economics of each problem and the way in which the engineer meets the problem.

Q. But in practical operations that is true, is it not?

A. Generally not. The system uses pile up more rapidly, depending upon the extent to which the energy is distributed, as between a few customers or many. Broadly speaking, one of the system uses which figures rather prominently is the charging of transformers. If service is being rendered to many residential consumers, these small transformers which are spread all over town have considerably greater requirement for energy to keep them charged than if it were one consumer and one transformer. I do not mean to grow technical, but the distance, in a practical transmission system, is not necessarily the controlling factor in these system uses. * * * It is one of the factors.

We do have line losses so-called. They generally will vary and increase with the greater length of line. For the same size of wire and the same voltage. For greater distance the engineer proceeds to use higher voltage so as not [fol. 208] to increase those system uses or losses. He is not able to wholly control that factor, but is limited by economic factors to the size of the conductor he would use.

Q. Your connections with transmission lines in Idaho and distribution net-works is such that you can supply electrical energy to any users upon that net-work within the territory served by your physical connections that you may desire?

A. Yes. After service was available from Bear River, the company wanted to give exactly the same degree of reliability to Idaho consumers as Utah; and these connections permit of rendering emergency service whenever required. We could serve territory around St. Anthony with electrical energy generated at the Oneida station, for instance, if we so chose to operate the system. That would only happen though in case the Ashton, St. Anthony and Idaho Falls plants were shut down. That is, in case no power were available within that Upper Snake River Valley system. But we could cut those plants out if we chose. If they were all shut down, then the power would flow from Bear River up there. The direction of the flow of power and energy is not at the moment within any human control on the power system itself. It depends upon the consumer. He makes it flow to where he wants it.

Q. But as between different localities, for instance, each one of which we will say has such devices which may be physically connected to a line and operated in connection therewith, you direct or route your current to one or the other by the construction and use of the transmission line?

A. No, you cannot do that. You can merely provide the path for the flow of power, but as an operator of a power company, I could not force a kilowatt hour on any consumer anywhere or on any group of consumers unless they first put themselves in a position to demand it. I could not direct it.

Q. I am assuming that the demand is made, and aside from the question of demand by the consumer, which I fully admit the necessity of, you build your line to one point [fol. 209] or the other?

A. Yes. * * * And with installed capacity at any particular plant, we can construct a line from there to any community within a practical economic range, and with physical connections made at that community, there being a demand upon the part of the consumer, we can then serve that community. In other words, the construction of a station at a particular point does not itself determine the points into which electrical power may be taken from that station the next year or the year following.

Q. As a further illustration, you spoke of the delivery of power to the Utah Copper Company over high voltage lines and with a heavy load factor. As I understand it, the Utah Copper Company has its own net-work of distribution lines extending over a territory covering its operations?

A. The Utah Copper Company is supplied, as I stated, by 130,000 volt lines extending from terminal to the sub-station of the Utah Copper Company at Magna, in the Garfield area. From the Magna sub-station, the Utah Copper Company has lines running to its Magna mill, its Arthur mill, and to the mine in Bingham Canyon.

Q. And upon its net-work, the Utah Copper Company chooses its point of use perhaps from one point to another or varying between days?

A. If you mean that they have it in their control to say what motors they shall operate at any time, and where they are, yes. Perhaps at one near point or perhaps at a point miles distant. And they may also, choosing between different devices, generally speaking, control the character of use to which they put it. Over all these things the Power Company has no control.

It merely delivers to their connection at Magna the amount of energy demanded by the consumer, which represents the composite demand of the Copper Company's uses and a great many Copper Company's devices.

Q. You spoke of the Dispatcher having no control whatsoever over a choice as between one plant and another and as to which should deliver the energy demanded by the load upon the transmission line at the moment of incidence of an increased load?

[fol. 210] A. Yes, that is correct.

Q. However, the Dispatcher directs the attendants or operators of the different stations to put one plant in readiness or two, or different ones as he chooses, and in that

manner does control the station which will deliver that electrical energy at the time the increased demand is exerted upon the system?

A. The question is one of point of time. The Dispatcher does make an estimate of the load which he expects to come on in the near future. That is the total aggregate load; and he does determine what machines shall be ready to take that load when it occurs. But at the moment, at the instant the load occurs, he has no part whatever in the action. It occurs instantaneously, automatically; the consumer requiring an amount of energy which is instantly supplied by the machines running ready to supply it when the consumer demands it, and at that instant the Dispatcher has no control whatever unless he wants to completely interrupt the consumer by opening a switch. That is the only control he has.

Q. Do you know the comparative cost of generating your power by steam plants in Utah at that time as compared with construction of these hydro-electric plants and the additional transmission line required to get that to Utah consumers?

A. I have no data of that with me, and I cannot tell you figures and calculations made. After all, that is a theoretical rather than an actual calculation, because of the fact that that is a hydro system, but our researches and our studies satisfied ourselves as to the program that we carried out in its economic wisdom.

Q. Considering the physical features of the country and place where water could be found and the point to which it could be taken, it would have been possible for you to simply have flumed or conducted all the water down to a station terminal and generated your power there?

A. Well, as a physical matter, knowing that country very thoroughly, I would say it is possible, but it is certainly not practical. It would not have been economically practical to have diverted it, to transfer its energy from the points in Idaho at which the fall could be utilized, by [fol. 211] any such mechanical means as moving belts and pulleys. It would have been possible but not practicable. That is the reason for electrical transmission.

Redirect examination.

By Mr. MacLane:

Q. A question was asked on cross-examination as to whether power from the station went out as current over the lines. Are power and current synonymous?

A. No, not at all. Current is one element of deriving power, but they are not synonymous.

Q. What is meant by the station bus?

A. The station bus, or more strictly the station bus bars are the electrical conductors within the station, so arranged that generators may be connected to them or disconnected from them, and also so arranged as to permit the connection or disconnection of outgoing lines. There is no interruption of either the flow of current or of power at the bus except complete interruption by throwing the switch and completely disrupting the circuit. The bus is not the point of origin of the power which is delivered to the consumer. It is merely one part of the path for the transmission of power from the generator to the consumer. The point of origin of the power as electrical power which is delivered to the consumer is in the generator; as mechanical energy it is in the falling water.

[fol. 212] J. A. Hale, a witness on behalf of the plaintiff, testified:

Direct examination.

By Mr. Corey:

J. A. Hale, Salt Lake City, Utah, Chief Engineer of the Utah Power & Light Company. I received my degree in civil engineering from the Virginia Polytechnic Institute in 1911. I have been connected with the Utah Power & Light Company for the past eighteen years. Except during about a year of the World War I have been employed at either doing construction work for the company or directly by the company. I have occupied the position of chief engineer since the early part of 1926. As such I have charge

of the operation and maintenance of the company's interconnected generating and transmission system.

I have here a diagrammatic map, not exactly to scale, which shows in general the territory served by the Utah Power & Light Company, the generating stations, and transmission line. The high voltage line of 130,000 volts is shown by the heavy line. The medium and low voltage lines are shown by lighter line-. The generating stations of the company are designated by hollow squares, and the name of the plant is shown against the squares.

(Plaintiff's Exhibit "C" admitted in evidence, and is as follows:)

PLAINTIFF'S EXHIBIT "C"

(Here follows exhibit, side folio 213.)

[fol. 214] The company owns and operates an inter-connected, inter-state, alternating current, three phase, 60 cycle electric power system, consisting of generating stations, transmission and distribution lines, and other electrical facilities, located in Idaho, Utah and Wyoming, (extended to Wyoming in the early part of 1929,) by which energy in the electrical form is generated, transmitted and distributed in southeastern Idaho, northern and central Utah, and southwest Wyoming, and between those states. That part of the inter-connected system that is located in Utah and Wyoming, which I have called the "Utah Section," consists of medium voltage, that is 44,000—11,000 volts, transmission line, connecting some twenty hydro-electric and steam generating stations, having a combined installed capacity of 116,000 kilowatts, and medium and low voltage, that is 44,000—110 volts, transmission and distribution line, by which electric energy is distributed and used within said states. That part of the inter-connected system located in Idaho, with lines extending into Utah, which I shall hereafter refer to as the "Idaho Section," consists of:

First, medium voltage, that is 44,000—110 volts, transmission lines connecting the following generating stations:

Ashton, Fremont County, Installed capacity	5,800 kilowatts
St. Anthony, Fremont County, Installed capacity	500 kilowatts
Idaho Falls, Bonneville Co., Installed capacity	1,875 kilowatts
Paris, Bear Lake Co., Installed capacity	650 kilowatts
High Creek, Franklin Co., Installed capacity	550 kilowatts
Total installed capacity	9,375 kilowatts

and medium and low voltage transmission and distribution lines extending therefrom, whereby electric energy is generated, transmitted and distributed for use within the State of Idaho. This part of the system, the "Idaho Section," is of sufficient capacity to, and normally does, generate and distribute practically all the electrical energy required to serve the company's customers in said state. For example, during 1930 these stations generated 33,285,000 kilowatt hours, whereas the total sales, losses and station uses pertaining to Idaho business in Idaho was approximately 28,343,000 kilowatt hours. These lines are also connected with

[fol. 215] the interconnected system of the Idaho Power Company at Pocatello, and Blackfoot, Idaho, and by means of such interconnection electric energy may be transmitted in either direction as the demands of either system may require, thus affording assurance of continuity of service on both systems.

Second, what is known as the "Bear River System" consisting of two 130,000 volt transmission lines, carrying three circuits, known as the "Grace-Terminal" lines, extending from the Grace Generating Station, with an extension to the Soda generating station, in Idaho to a receiving and switching station named "Terminal" in Utah, two 44,000 volt transmission lines from the Grace station to a point of contact with similar lines in Utah, and the following generating stations on Bear River in Idaho, likewise connected to the Grace Terminal lines.

Soda, Caribou County	14,000 kilowatts
Grace, Bannock County	44,000 kilowatts
Cove, Bannock County	7,500 kilowatts
Oneida, Franklin County	30,000 kilowatts
Total installed capacity	95,500 kilowatts

In addition to these stations there is a 30,000 kilowatt station on the Bear River in Utah, known as the "Cutler" station operated in connection with the "Wheelon" switching station, which I shall mention hereafter, and connected with the 130,000 volt transmission line to Terminal station. While this Cutler station is operated in parallel with the Bear River system, I do not include it as part of the Idaho section, but as part of the Utah section as previously described, on that part of the inter-connected system located in Idaho.

Q. You have distinguished between the Bear River system, and the medium and low voltage systems, do you know for what purpose the Bear River system was constructed and is now primarily used?

A. It was constructed solely, and it is now used primarily, for serving the company's customers located in Utah.

After supplying station uses, more than 98 per cent of the electrical energy generated at these stations is transmitted directly over the Grace-Terminal line, and 44,000 volt lines,

[fol. 216] and used for supplying customers of the company in Utah, and transmitted through Utah for Wyoming uses. The remaining two per cent or less of electrical energy generated at these stations is distributed and used as follows:

First. An insignificant portion is distributed at low voltage from each of said stations to small neighboring communities.

Second. The 44,000 volt lines are tapped enroute to Utah for local Idaho uses at a single sub-station at Preston, Idaho.

Third. The Grace station is connected with the medium voltage transmission lines of the Idaho section, which I have previously described.

I have prepared an exhibit showing for the calendar year 1926 and for each succeeding year thereafter to and including the first eight months of 1931, the operating data of the Idaho stations of the company with respect to their output in kilowatt hours, and the disposal of energy as between company uses, deliveries to Idaho customers, and deliveries to Utah. For the year 1930 the first column of the table shows total energy generated at all of the Idaho stations as 233,253,000 kilowatt hours. The second column shows the total energy generated at Idaho stations other than Bear River stations, 33,285,000 kilowatt hours. The third column shows the total energy generated at Bear River stations in Idaho as 199,968,000 kilowatt hours. The fourth column shows total station use at Idaho station- including Lifton and line use due to Lifton load, as 6,978,000 kilowatt hours. The fifth column shows total energy delivered to Idaho consumers including company use at division offices, 24,046,000 kilowatt hours. The sixth column shows total energy from company Idaho stations for transmission to Utah 198,502,000 kilowatt hours. The seventh column shows measured output of Bear River stations in Idaho to 130,000 volt transmission lines, 161,649,000 kilowatt hours.

By agreement exhibit was copied into and made part of the record and is as follows:

EXHIBIT IN EVIDENCE

[fol. 217] Utah Power & Light Co., Salt Lake City, Utah

September 25, 1931.

Year	Total energy generated at all Idaho stations M-Kwh.	Total energy generated at Idaho stations other than Bear River stations M-Kwh.	Total energy generated at Bear River stations in Idaho M-Kwh.	Total station use at Idaho stations including Lifton and line use due to Lifton load M-Kwh.	Total energy delivered to Idaho consumers including company use at Division Offices, etc. M-Kwh.	Total energy from company's Idaho stations for transmission to Utah M-Kwh.	Measured output of Bear River stations in Idaho to 130,000 volt lines M-Kwh.
1926	416,875	45,823	371,052	10,998	17,284	385,914	316,192
1927	308,476	43,259	265,217	7,727	17,226	280,853	222,302
1928	265,042	41,051	223,991	7,649	18,896	235,568	179,294
1929	244,629	36,099	208,530	5,453	20,281	215,752	173,268
1930	233,253	33,285	199,968	6,978	24,046	198,502	161,649
1931 (8 Mo.)	160,103	19,258	140,845	7,575	16,294	133,708	115,145

NOTE: M-Kwh means thousand kilowatt hours. For instance the first figure given in the table is 416,875,000 kilowatt hours and so on for all the figures given.

Q. What is the relation as shown by the table of kilowatt hours generated at Idaho stations other than Bear River stations, that is column 2 to the kilowatt hours delivered to Idaho consumers, that is column 5?

A. It shows that the kilowatt hours generated are more than sufficient to supply the Idaho consumers' uses and includes station uses at Idaho stations for running auxiliary apparatus, such as pumps, ventilator fans, supplying light to operators' cottages, and uses of that kind and for operating the pump at the Lifton Pumping station, which is the pumping station located at Bear Lake, whereby the water is pumped from the lake into the river. This water is later used for irrigation purposes, down along Bear River. Column 6 shows that the total energy generated by all of the company's Idaho stations which is available for use in Utah, that is, Idaho sales, and Idaho station uses, taken out [fol. 218] of the total. It includes the kilowatt hours shown in column 7. That is to say, it includes both the 44,000 volts and 130,000 volts transmission and all that energy is transmitted to Utah, except for the usual line losses. We have at the Bear River stations meters which measure the output to the 130,000 circuit. The last column shows definitely and accurately what that output is. That energy actually goes to Utah, and there are no taps to the 130,000 volt lines in Idaho for service in that state. The figures in the various columns in the exhibit show as to years other than 1930 generally the same condition as existed in 1930 relative to the disposal of energy generated, and show accurately the amount of electric energy delivered at the station for transmission to Utah.

Meters placed in the several generating stations show the so-called station output in kilowatt hours. The amount of electrical power or energy delivered to consumers is measured by meters at the consumer's point of use. We can and do measure at the generating station the amount of energy generated, and frequently measure the output to the transmission lines, which leaves from the station. The demand of the various consumers for power is expressed in these measurements in the aggregate, but the net amount delivered to any consumer, and the amount on which he is billed, for which he pays, can only be determined by

measurements at the consumer's point of use, because of intervening system uses or losses.

There is no practical commercial way, in such interconnected systems as that of the Utah Power & Light Company, by which energy generated at its Idaho stations for barter, sale and exchange, can be measured, because the energy generated at the Bear River stations goes over the interconnected net-work of transmission lines in Utah, and loses its identity with the energy generated in the Utah section, so that the consumers' meters in Utah register the energy received by the consumers without reference to its source. It may be assumed for general statistical purposes that the same percentage of power generated in the Bear River system is actually delivered to the consumer as it is generated in the system as a whole, but the result of course is simply [fol. 219] a computation and not a measurement. If we had a single generating station and a single consumer, the amount generated and delivered to the consumer could, of course, be determined accurately, but such determination can be arrived at only by computation, and then only approximately upon an inter-connected system. . . .

Q. What do you mean by the generation of electrical energy?

A. I mean that part of the process of transfer of energy from its source in nature to its point of use, which is accomplished by the so-called generating unit, this consisting of a water wheel, or steam turbine, a generator and auxiliary apparatus.

Q. Describe specifically the generation and transmission to Utah of electrical energy by the Bear River system.

A. Water is collected and diverted from the channel of the Bear River at each plant by means of a dam, and an artificial conduit where it can be controlled readily under head or pressure. This conduit leads to a turbine, through a valve or gate by which the entry of the water into the turbine is regulated. The turbine is connected by a shaft directly to the electric generator. The turbine valve is operated by a governor, which in turn is controlled by the load demand upon the generator. Attached to the turbine shaft is a rotor, the rotating element of the generator, which rotates within the stator, the stationary part of the generator. Wires lead from the stator through a switch to a set

of common wires called the station bus. This bus is connected by wires through a switch to a transformer where the voltage is raised or "stepped up" to the desired voltage of transmission. The transformer is connected to the transmission line.

When there is no load demand by customers for service, the turbine valve is opened only sufficiently to permit the entry of sufficient water in the turbine to hold the equipment under constant rotation and electric charge in instant readiness to serve, and no energy is generated beyond that required for this purpose. The balance of the available water is held back, or allowed to pass around the turbine into the channel of the stream. Immediately when electric energy is demanded by customers, this demand asserts itself at the [fol. 220] generator causes a slight retardation of the rotating part, causing the governor to so open the turbine valve as to permit the required additional water to flow through the turbine. By this means, the energy of the falling water is instantaneously transferred through the turbine shaft to the generator, which it leaves in the form of electrical energy passing through the station bus and the transformer and over the transmission lines to the point of use.

After the water passes through the turbine it is used for irrigation at points lower down the river. The generators operate at 2300 or 6600 volts and 60 cycles. The generation at some such relatively low voltage is economically necessary because of the difficulty and expense of properly insulating, within the narrow spaces of the generator, for generation at transmission voltage.

The voltage of generation continues to the "step up" transformers, which raise the voltage from the voltage of generation to approximately 130,000 volts, at which voltage the electrical energy is transmitted over the Grace-Terminal lines to Terminal station in Utah, and to 44,000 volts for like transmission to point of contact with 44,000 volt lines near Logan, Utah. Electric energy generated at Grace, Cove, Oneida and Soda stations is transmitted directly over the Grace-Terminal lines to Utah. No taps or connections are made on these lines for service in Idaho. There is a switching station at Wheelon, in Utah, at which point electric energy is also received over a like 130,000 volt line, connected to the Idaho Power Company's generating station

at American Falls, Idaho. Two 130,000 volt lines extend from the Grace-Terminal lines, at Terminal, to the Utah Copper Company at Magna, Utah. That company takes the electric energy direct at that voltage. Except for this use, all electric energy brought to Terminal over these Grace-Terminal lines is there stepped down to medium voltage, transferred to a medium voltage bus, and made available over medium voltage lines extending to the communities and load area of the Utah section, and co-mingling on these medium voltage lines with electric energy generated at the company's station located in the Utah section.

[fol. 221] Q. Can you illustrate by the actual operation of some part of the system the process whereby the use of electric energy is supplied to a customer in Utah through the Bear River system?

A. A description of the process whereby electric energy by the Utah Copper Company is supplied will illustrate this very clearly. Tap lines from the Grace-Terminal line, at Terminal, extend directly to the Copper Company at Magna, Utah, where the Copper Company steps down the voltage from 130,000 volts to medium or low voltages, at which it distributes and uses such electrical energy over lines owned and operated by it. At any time electrical energy is required by the Copper Company at any point on its lines, an employe of the Copper Company simply closes a switch, thereby completing the electrical circuit which operates the electrical equipment desired to be used. For example, if this equipment be a motor, the motor immediately starts to rotate, thus requiring the generators on the Bear River system to carry more load, this additional load being picked up by the generators.

The above is illustrative of the method by which the electrical requirements of the company's other customers in Utah are satisfied.

The company has about 80,000 customers in Utah. These customers are served under contract with the company.

The voltage at which these customers are served ranges from 110 volts to 44,000 volts. Power demands of these various customers vary from a fraction of a kilowatt to several thousand kilowatts, or more.

Q. Explain how these customers' uses and demands for electrical energy impress themselves upon the inter-connected system of the company.

A. Electric energy is taken by these customers, and each of them, if, as and when they choose, by their merely closing a switch or pushing a button. This electric energy is not and cannot be practically furnished from a storage battery, but is instantly transferred from a generator.

It is not possible to store electric energy on our system.

The Utah section consists of a net-work of 44,000 and 11,000 volt transmission lines, plants and distribution sys-
[fol. 222] tems in Utah, which are ultimately connected at Terminal. Except for a steam generating plant located at Salt Lake City, these plants are isolated plants, located on streams, the flow of which is not regulated by storage, and there is virtually no storage of water in the diverting works of the plants themselves; consequently these plants operate as run of steam plants, at the effective capacity furnished by the available water, being generally near centers of load in Utah, and while it is impossible to definitely distinguish the destination of any particular power, yet usually their output is absorbed by consuming devices in Utah in this interconnected system. In the aggregate, the capacity of these plants is insufficient to satisfy the demands, the load demands, of the Utah customers. As previously stated, the Terminal sub-station is the central point of the interconnected Utah net-work. The aggregate residual demands from the Utah interconnected system, after applying to their satisfaction the output of the Utah plants, impresses itself on the Bear River plant by way of Terminal sub-station which is not in any sense a consumer of electric energy, except in the sense that any substation is a consumer of electric energy for operation of transformers, lighting and use by auxiliary equipment.

The functions of the Chief Dispatcher, who is directly in charge of the service, are primarily, to forecast by a study of the load charts the demands to be made at any time by the consumers on the system, and to see that generators and transmission lines are kept in readiness to meet the demand, and to designate from time to time which stations and which lines shall carry the load, in such a way as to insure service on the one hand and avoid waste on the other.

Q. Can your dispatcher switch power to the consumer and to the power lines?

A. No. His function is really the reverse. The company, or no employe of the company, can in any way control the

customer's demand, except of course by opening switches and refusing to give service, nor can the company nor any [fol. 223] employe of the company switch to any particular customer the output of any particular station. What the dispatcher does first is to see that sufficient generators of sufficient capacity are rotating on the line available to satisfy all the demands of the consumers coming on the line. This consumers' demand impresses itself on the generators instantly, and is met instantly without any sort of company control. After the demand has asserted itself, however, the dispatcher may direct that any particular station or any particular generator which is not required to be kept in operation to meet the aggregate demand, may be closed down, or any other generators may be placed in service to take all or part of the load from generators previously in service, but the dispatcher has no control whatever over the aggregate demand or load.

Q. How is the electric energy required for service to the Idaho section of the company's interconnected system delivered?

A. In the same manner as I have described for the Utah section, that is, the demands of customers on medium and low voltage lines in Idaho impress themselves on the adjacent local generating stations. If the demands are not fully satisfied from these stations, that part which is not so satisfied may impress itself upon the generator at the Grace station through the interconnection, but as I have previously stated, there is normally in the aggregate an excess of capacity in the local Idaho station over the Idaho demand, and the actual demand on the Bear River stations for Idaho service is negligible.

[fol. 224] Mr. Corey: We desire to offer a few questions and answers with respect to the application of Section 5 of the Tax Act, which are not strictly within the order of reference to the Master. We ask that counsel for the State may permit this, with the same effect as though the testimony were offered directly to the statutory court, but subject, of course, to all objections which might be made if the testimony were so offered.

Mr. Barber: That is agreeable.

Mr. Corey: And we desire to ask that the testimony heretofore offered in the form of the Lukens' affidavit be

similarly considered and the objections as stated by counsel be deemed as though made in the presence of the statutory court.

Mr. Barber: That may be.

Q. I will ask you, Mr. Hale, if the company furnishes electric energy for pumping water for irrigation purposes in Idaho?

Mr. Barber: I object to that as irrelevant, immaterial and incompetent, and not pertinent to any issue now in this case, under the decision of the court.

A. Yes.

Q. How many such customers does it have?

Mr. Barber: May it be understood that our objection goes to all of this, in order to save time?

Mr. Corey: Yes.

A. 56.

Q. At how many points is such electric energy used and measured?

A. 68.

Q. For the calendar year 1930, what was the consumption of electric energy for these customers?

A. 6,838,000 kilowatt hours, measured by watt hour meters, located near points of use at the end of the tap line furnishing the service, usually a good many miles from the [fol. 225] generating station. These measurements represent the electric energy actually used which forms the basis of the customers' billing. They do not show or represent the number of kilowatt hours generated at the place of production or the generating station because of the transmission, distribution and transformer use, or so-called loss, incident to all electric transmission and distribution lines, which in some cases will amount to as much as 20% of the electric energy generated, but will vary as to each place of use, according to distance, size of conductor, kind of line, and other variables. It is practically impossible to accurately determine the exact loss between the place of production, or the generating station and each point where such electric energy is actually used. Some of the water pumped for irrigation in Idaho is used for irrigation of land in Utah. I do not know the acres so irrigated, nor the

amount of electric energy delivered to pump water for irrigation of land within the State of Utah. No such information is available from any measurements or records in possession of the company because the water is pumped in Idaho by a single consumer through a single pump, and some of the water is used for irrigating land in Idaho, and some is used for irrigating land in Utah.

Mr. Corey: That ends the examination on that particular question, Mr. Barber.

Q. What would you say as to the present and future operations of the company with respect to the matters which we have discussed in your testimony; that is to say, as to the generation and disposal of energy on the Bear River system, and the methods of operation and relation between the different parts of the system?

A. The present operations are as I have described. The Bear River system is being used primarily to satisfy Utah consumers. The local use from the system in Idaho is no greater than it has been. So far as the future is concerned, I have no reason to anticipate any change.

[fol. 226] Q. Assume a load of 1 kilowatt on a Bear River station in Idaho, in response to a demand of a Utah consumer. Is it possible to measure the kilowatt hour on that load at the generator until it has been consumed or used by the consumer in Utah?

A. No, because the generation and use is simultaneous and the problem is not different in principle with respect to the aggregate load on the Idaho Bear River generators, and the aggregate consumption in Utah. The aggregate power generated in Idaho must be simultaneously consumed in Utah, and the measurements cannot take place at the generator, or any other place on the system, except as the power is being simultaneously used. The energy is passing over the state line between Idaho and Utah at the time the measurement takes place. The number of kilowatt hours generated on the Bear River system's plant in Idaho for the months of June, July and August 1931 is

June	23,557,000	kilowatt hours
July	34,564,000	" "
August	32,262,000	" "

and the number of kilowatt hours used for station uses on the plants of that system, including also the Lifton Pumping Plant is

June	1,081,000	kilowatt hours
July	1,880,000	" "
August	1,565,000	" "

The number of kilowatt hours delivered by these plants to the transmission lines for Utah use is

June	22,443,000	kilowatt hours
July	32,649,000	" "
August	30,663,000	" "

It is not possible from any meter which the company has, or which it could install at the generating stations or so-called place of production, to record or determine the actual number of such kilowatt hours generated for barter, sale or exchange.

[fol. 227] Cross-examination.

By Mr. Barber:

When I spoke of generation as being a part of the process of transferring energy, I did not ignore the fact that there is also in the process of generation a transformation or conversion of the mechanical energy in the turbine shaft into a different form of energy, that is, electrical energy.

It must be converted into electrical energy before it can be transmitted and before it can be used for lights, motors and other devices for which we now use electrical energy.

This process of transformation is complete at the generator, and you have a greater amount of energy there, capable of doing a greater amount of mechanical work, at the generator than you do after transmitting it into Utah.

I do not know just what happens inside the generator. The operation of the generator and that of the transformer is somewhat similar.

You have no physical contact between the two parts in either, but you have a magnetic field of force in one, cut by the moving conductors—that is in the generator.

While in the transformer, this magnetic field cuts the wires of the secondary circuit.

We can transmit 2300 volts or 6600 volts current for some distance, but it would be impossible to transmit that over the system we now use—that is, over the wires or the conductors—and get any appreciable part of that energy down to consumers in Utah.

This 6600 volt or 2300 volt current generated at the station could be utilized by a consuming device without transformation, if that device were so constructed as to be adapted to such voltage, but if that same device were connected with the 130,000 volt current on the other side of the transformer, it would not operate.

A kilowatt hour is the ordinary unit of measure of electrical energy and an amount of energy that will accomplish [fol. 228] a certain amount of mechanical work and an amount that may be delivered over the course of two hours or in the course of a second or two.

The response of the generator to an increased load or demand upon the wires is made possible by the use of certain controlling devices which cause the turbine gates to admit a greater amount of water to the turbine wheel.

We have local markets in Idaho, around Ashton, St. Anthony, and Idaho Falls and the Paris Creek station.

We have a generating plant near Shelley. At the present time it is not operating. We are able to use it if we need the output of its generators.

Q. Do you know when the Ashton plant was installed, approximately?

A. It was rebuilt approximately in 1925 or 1926.

The St. Anthony plant was built in 1914.

I do not know the comparative market which the operator of the St. Anthony plant had in 1914, as compared with today. Generally, I think there is not so very much difference.

Presumably it has increased since 1914, naturally, I would assume that it has increased, of course, it is a matter of speculation as to how much power we will be able to market there in the future.

Q. Your system is so inter-connected, however, that if an increased market should occur, or be developed there, you would be able to supply that with power generated at other stations than at the St. Anthony station, if you chose?

A. If it was necessary, yes—with the connections which

we could make with energy generated by the stations on the Bear River system, but I think it would take a very unusual growth to necessitate that connection.

Some of the Bear River stations have one, some two, some three and one five generators. Normally the output of all the generators that are operating at a single station is conducted through a common bus.

[fol. 229] At some point between the generators and the bus, or immediately adjacent to the bus, is the first point at which the output of the generator can be measured.

Meters placed immediately adjacent to the transformer, on the wires coming from the generator, will measure a greater amount of electrical energy than meters placed upon the secondary side of the line going out to consumers, the difference being the use of the transformer itself. This use accomplishes no purpose except to enable the transformer to function.

The percentage of loss at the transformer is very small; probably less than one per cent, or thereabouts.

By "line uses" I mean that part of the energy which is used in the normal functioning of the line. I don't know exactly how it is used, but probably in creating magnetic fields, or something of that order, or overcoming the resistance of the line, or overcoming the reaction of the line.

There may be some leakages, in the line too, but they are very small. The amount of leakages depends upon the efficiency of the maintenance of the line to some degree. If the loss is excessive, the line refuses to function. I believe it might also depend upon weather to some small degree.

Q. About how much power, if you know, do you receive a year from the Idaho Power Company?

Mr. Corey: We object to that as irrelevant and immaterial. That is assuming that he knows. I don't know that he knows.

A. I don't know. I have not the figure here, Mr. Barber. It is a substantial amount.

Q. And at the point where it is delivered to you, is that metered or measured?

Mr. Corey: Is it understood that my objection goes to all of these questions along the same line?

[fol. 230] Mr. Barber: Surely.

A. Yes.

Q. And do you pay the Idaho Power Company for energy received at that point, on the basis of that meter measurement?

A. Well, I think so.

Our transmission net-work is so connected with the Idaho Power Company line that is is possible to deliver electrical energy generated at our stations to the Idaho Power Company for its customers.

Speaking of the inability of a dispatcher to control the output as between different stations, I meant that by his directing employes of the company, he can provide that the demand then being exerted upon the system be supplied by one station or another, provided, of course, that the capacity of that station is sufficient.

We meter the energy or power delivered to the Utah Copper Company at a point where our lines contact its line and we bill them upon the basis of that measurement.

We do not know at any time on what part of their system they are using that energy, nor is it necessary to the operations of our generating plants, or transmission lines that we do know. They may use it at the point of delivery, or some distant point on their lines, or they may use it in one device such as a motor, or in other devices such as lamps and this choice of use on their part makes no difference in the operation and conduct of our system, except, of course, as the amount of demand would vary.

All of our plants in Idaho are hydro-electric plants. Besides Shelley we have installed but not operating and not included in the tabulation a small plant at Georgetown.

Q. You could generate electrical energy at those stations, with different machinery, of course, by using the power from burning fuel instead of the power from falling water?

A. Different stations then.

[fol. 231] Q. You would have to reconstruct the station, I suppose?

A. Yes, sir. • • •

Q. Or in lieu of using those stations in Idaho, and the transmission lines of Utah, so far as power sold in Utah is concerned, you can generate that at a Utah station, constructed for that purpose, utilizing the power from burning fuel instead of the power from falling water?

A. We could.

Q. By so doing, you would save the so-called losses in transmission lines from distant points in Idaho to that point?

A. Yes. They would no longer exist.

Q. And you would save the cost of maintenance and construction of the transmission lines?

A. Well, I would say that we would not be at that expense at any rate—that is true, as far as future lines might be concerned.

Q. The cost of a transmission line, such as carries that 130,000 volt current from the Bear River system to the Utah line, is very heavy?

A. It varies, of course, with the type of line, but I would say beween five and ten thousand dollars per mile, and in addition, we have a maintenance cost in keeping that in an efficient state of use.

I am not familiar in detail with the power rights which the company has, under which it uses the water flowing in the streams of Idaho at these various stations.

The state rights are held under a permit and license from the State of Idaho.

I think we have state rights in connection with all the plants on the Bear River system.

Q. You are able to measure transmission losses accurately, if you install meters at such points as needed?

A. There is no way of measuring a loss at any one point. [fol. 232] A loss can only be measured or derived by measurements at different points.

Q. You do measure now the output of each of your big stations on the Bear River system, and with meters installed at the end of their transmission lines, at Terminal stations, or if you chose, on the line, you can measure the amount of energy delivered by them to that station, and similarly, you can accurately measure the amount of energy delivered to Terminal station?

A. Yes.

Q. Isn't it a fact that you could install meters there on the line and exactly measure it?

A. Yes. We, of course, can put meters on all in-coming lines, and measure what comes in.

Q. From that point on, the product of your Utah stations and Idaho stations is co-mingled, so that you cannot identify, with respect to any one customer, whether he is getting energy generated in Utah or in Idaho or both? But you are able to ascertain with fair accuracy, at least, the losses which occur through lines losses, or use, or transformer losses and so on between Terminal stations and the point of delivery to customers?

A. That could be done.

Q. When you spoke of the future operations of the company being similar to its operations as described by you during last year or preceding years, that was with consideration of the fact that the question of markets, or demands by consumers in the future is a matter of speculation?

A. Well, I think I said that I saw no reason to expect any great change.

In the operation of our hydro-electric plants we may at one moment be using all of the water which is there available—that is, generating the maximum amount of energy possible by the utilization of that water to which we have a right, and another time be using only a fraction of that [fol. 233] water. And when the demand upon the system does not require us to use the full capacity of all our generating plants, it is in the control of the dispatcher whether we utilize a station in Idaho to supply that demand, or a station in Utah.

Q. You spoke of the fact that the generation and use were simultaneous, and that delivery was accomplished immediately on the closing of the switch. Do you mean that that is true to an absolute degree?

A. I mean to a practical degree.

Q. There is a very slight delay there before, in response to that order for an increased load, the generators can respond to the increased output needed?

A. Well, I have to take other people's word for that.

Redirect examination.

By Mr. MacLane:

Q. You stated on direct that there is a deficiency of energy from the Utah section plants to supply the Utah

load. What effect would that deficiency have on the flow of power in the Utah section to or from Terminal?

A. It would cause the flow to be from Terminal.

There is no input to Terminal from the Utah section plants under ordinary conditions which could be measured.

There is not any place beyond Terminal, assuming that we could place meters at the end of the 130,000 volt circuits there, at which we could measure the power or energy originating on the Bear River system as such.

This power or energy that I refer to as coming down over the 44,000 volt lines from the Bear River system is first used to supply customers along the way in Utah and then delivered at Terminal itself.

It is inter-connected with the Utah section lines and stations, such as Logan and Hyrum, as shown on my exhibit. [fol. 234] We cannot distinguish in any way, by any form of metering, after it reaches the Utah section, whether the energy originates in Idaho or in Utah.

Cutler was connected directly to the 130,000 volt circuits, and its power feeds over those circuits into Terminal. When Cutler is in operation we could not distinguish by any meters which might be placed at Terminal, the origin of the power at Terminal, as between Idaho and Utah. The Cutler power or energy is co-mingled with that originating at the Idaho plants.

Energy from the different generators at various stations is brought together at the station bus which comprises part of an enclosed metallic circuit. There is no transformer or other break in the metallic circuit of any kind there.

As to the nature of a leakage from the transmission, such leakage is caused by faults—by imperfections in the line.

Speaking technically I do not understand that current is utilized by the consumer. The consumer uses energy. Energy and current are not the same thing.

The cost of transmission lines might run from five to ten thousand dollars a mile, but the steel tower high tension transmission lines cost considerably more than that.

Recross-examination.

By Mr. Barber:

It is electrical energy that is measured to the consumer, and he is billed on the basis of that measurement.

Redirect examination.

By Mr. MacLane:

Q. Bills also come that include a power component?

A. I believe that they do, in the nature of what is some-
[fol. 235] times called a demand charge, entirely independent of energy consumption.

G. M. GADSBY, a witness on behalf of plaintiff, testified:

Direct examination.

By Mr. Corey:

G. M. Gadsby, Salt Lake City, Utah. President and General Manager of the Utah Power & Light Company since February, 1929. I am familiar with the generating stations, transmission and distribution lines of the company, located in Idaho, Utah and Wyoming, and the manner of maintaining and operating them, and with the commercial operations of the company. The company is engaged in the generation, transmission, delivery and sale of electric power and energy to its customers in Idaho, Utah and Wyoming. The company delivers electric power to individuals and corporations for use in their homes, offices, mills, mines and other industries. We sell a small part of our energy to municipalities and other corporations for delivery by them to their consumers.

As of December 31, 1930, there were 91,986 customers. The number now is approximately the same as it was then. As of the same date, the number of customers in Idaho was 10,144. In Utah, 80,299. In Wyoming, 1,543. These customers get electric power and energy from our system under contract with our company.

This contract consists of three parts. An application for service, a schedule, and the rules and regulations.

PLAINTIFF'S EXHIBIT "D"

Leaving out the name of the consumer, the formal part, the date and the signature, the application reads as follows:

"X, A Corporation, herein called Consumer, applies to Utah Power & Light Company, herein called Company, for

electric service to the amount of 1,000 horsepower, in the form of three phase alternating current, at approximately 60 cycles per second and 44,000 volts, for Consumer's mining operations at or near Eureka in Utah County, State of Utah, under Company's Schedule No. 1, Tariff No. 2, and for a term of ten (10) years from date of commencement of service hereunder, not later however, than November 1, [fol. 236] 1927, Point of delivery shall be as specified in Rule 2 of the Company's Rules and Regulations.

"Consumer agrees to conform to and abide by the Schedule hereinabove designated and Company's Rules and Regulations governing this Service, making all payments thereby required, including all minimum charges. Said Schedule and Rules and Regulations are hereto attached and made a part hereof.

"All payments shall be made at Company's office in Provo, Utah."

"This schedule is applicable to all consumers, for alternating current, three phase service, supplied at voltages in excess of 15,000 volts, for power purposes only.

"Charges:

(a) Demand: Two dollars ($2) net per month per contract H. P., which charge entitles consumer to use free during such month 100 K. W. H. for each H. P. of contract power.

(b) Energy: 1.00c net per K. W. H. for the next 100,000 K. W. H. of monthly consumption; .85c net per K. W. H. for the next 10,000,000 K. W. H. of monthly consumption; .80c net per K. W. H. for all excess monthly consumption.

"Rules and Regulations: Service under this schedule is subject to the company's General Rules and Regulations now or hereafter on file in the Company's office and with the Public Utilities Commission of the State of Utah. In case of conflict between any provision of the schedule and such Rules and Regulations the schedule shall apply."

With reference to the charges, the schedule provides certain discounts, and also seasonal rates when the service is taken for less than the entire twelve months.

Rules numbers 1, 2, 3 and 44 of Rules and Regulations which are part of the contract were read:

[fol. 237] "1. Electric service is the furnishing of electric power and energy in the form, at the voltage and for the purpose specified in the application for service. The Company will not change the form or voltage thus specified so as to interfere unreasonably with the proper operation of the Consumer's apparatus.

"2. Point of delivery is the point where the Company wires or apparatus are connected with those of the Consumer. Unless otherwise specified in the application for service, such connection will be not less than two feet outside the exterior walls of the Consumer's building, for low voltage service (100-440 volts) and at the manhole or pole on the Company's transmission or distribution line nearest the Consumer's place of operations for service in excess of 440 volts.

Each point of delivery shall be measured by a single meter of each kind needed for each consumer served. Two or more points of delivery to one consumer shall be considered as separate services and bills separately calculated for each point of delivery.

"3. Delivery of electric service is the maintenance by the Company, at the point of delivery, of electric service at the voltage and in the form specified in the application.

"44. Increase of Consumer's Demand: Increases in Consumer's demand, not exceeding 100 h. p. and within the capacity of the portion of Company's transformers and circuits used for Consumer's service, may be made at any time by use. No greater increases shall be made, except upon acceptance by the Company of written notice from the Consumer to the Company, not less than 60 days before the date when such increase becomes effective. The Company may decline to meet such increased demand when it has not the required additional power available for use by the Consumer at the point of delivery; but in such case the Consumer shall be relieved to the extent of such additional demand, from his obligation to take service exclusively from the Company."

[fol. 238] Mr. Corey: Let the record show that copy of this contract is marked Plaintiff's Exhibit "D" for identification.

Q. I will ask you if the contracts between the company and other consumers are similar to this one?

A. This contract is used for all consumers taking over 15 h. p., and for consumers less than 15 h. p., we have a form of card application that is signed by the consumer and the company, and is in substance the same language as the application, from which I have just read. The card application refers to the schedule and the same rules and regulations from which I read.

(Plaintiff's Exhibit "E" marked for identification.)

All customers enter into a contract on either one form or the other before they are connected to the company's system.

After the customer signs the application, his appliances, or consuming devices, are connected to the company's lines, and thereafter service is available at all times, day or night, by the customer simply throwing a switch.

Q. In the development of the electrical systems, are these contracts usually made or at least in prospect, before additional developments are made to meet the demands?

A. Yes. The demands for power increase, and as these demands increase, extensions are made to the system, and provision is made for taking care of the requirements, and before such extensions and additions are made, there are either contracts available, or substantial expectations of making such contracts and having the consumers demand additional service.

Q. Do you keep a record of the kilowatt hours, measured at the *at the* generating stations?

A. Yes, for statistical purposes, and in order to keep track of the performance of each plant, the capacity for supplying additional customers' demand, and the relative costs. These records are of value for determining and com- [fol. 239] paring operating costs and planning future extensions.

These station records are not used in billing consumers. The important thing in billing consumers is the reading of the customers' meters, because they measure the service that he contracts and pays for, and for which the company receives payment.

The total gross kilowatt hours measured on the system for the year 1930 was 758,692,000 kilowatt hours.

The total kilowatt hours measured and reported by consumers' meters as delivered to consumers during the year 1930 was 623,761,000 kilowatt hours.

The company's gross receipts received from the sale of electric power or energy during the year 1930 in Utah was $9,711,000 and for Idaho approximately $735,000 and for Wyoming approximately $146,000.

The average rate per kilowatt hour for the gross energy measured on the company's system during the year 1930 was 1.397 cents per kilowatt hour.

The average rate per kilowatt hour for the net energy measured to consumers during that year was 1.698 cents per kilowatt hour.

If the company were obliged to pay a tax in the amount of one-half mill per kilowatt hour on all of the power and electric energy generated in Idaho, such a tax would be a charge of approximately 3.58 per cent on the average sales values of the gross kilowatt hours, measured at the Idaho plants, and if assessed against the kilowatt hours, measured to consumers, approximately 2.94 per cent.

Mr. Corey: The following questions and answers with relation to Section 5 of the Act may be received, subject to the provision that was made in tha taking of Mr. Hale's testimony with reference to the same question.

Mr. Barber: That is agreeable, subject to the same objection on the part of the defendant.

I am familiar with the so-called exemption provision of [fol. 240] the Idaho Kilowatt Hour Tax Law, commonly referred to as Section 5 of the Act.

Q. Will you please explain the difficulties your company would experience if it attempted to comply with this section of the law?

A. First, the law proposes to exempt all electricity and electrical energy used for pumping water for irrigation purposes to be used on lands in the State of Idaho, except where the water so pumped is sold or rented to such irrigated land. One company connected with our lines, and pumping water in Idaho, irrigates land in both Idaho and Utah. Our company has no knowledge or means of obtaining knowledge of the amount of land so irrigated in either state, and could not determine the proportion of the power

used at its pumping plant for irrigating land in Idaho. Again, our company has no knowledge as to whether water pumped by different persons and corporations connected to our lines is sold or rented. Again, the Act provides that the full amount of the license tax which would have been due from the producer if such exemption had not been made shall be credited annually for the year in which the exemptions are made on the power bill of the consumers. These consumers' meters are read each month and the billings are made upon the readings, whereas the Act provides that the credit shall be made annually for the year in which the exemptions are made. It does seem that the credits can only be made at the end of the irrigation season, and at that time bills will be rendered to the irrigator and paid by him. The reading of the different meters is made at different times, that is, a system of rotation is used, and one irrigator's meter may be read on the 18th day of the month and another on the 20th, and another on the 21st, and so forth. Next, the Act provides that the full amount of such license tax which would have been due from such producers of electricity and electrical energy, if such exemption had not been made, shall be credited annually for the year in which the exemptions are made on the bill to the consumer. The billings to irrigators are based on measurements made at the place of use. The computation [fol. 241] of the tax is based on measurements made at the place of production. These two points of measurement, that is, the place of production and the place of use, are sometimes separated by many miles, and intervening losses, or system uses, may amount to as much as twenty per cent. There is no means available for determining either the total of the system uses or losses, applicable to the irrigation load in the aggregate, or to the uses or losses that are applicable to the individual irrigation consumers. Measurements at the station give the gross kilowatt hours at the station. The losses will vary to some extent with the distance of transmission to the consumer's place of use, and the character and size of the conductors, and also in relation to the size and number of transformers that intervene between the station and the main transmission line and the consumer's point of use. The irrigation customers are served various voltages, from 44,000 to 2300 volts. So-

we have this situation: We cannot follow the provisions of the Act requiring determination of the exemptions at the so-called point or place of production, and the Act does not give us any other means of determining the basis of exemption. Finally, the credits to the irrigators, after all, means that the company pays to the irrigator a sum equivalent to the tax, and this sum is paid out of the earnings of the company.

Mr. Barber: No cross-examination.

FRANK W. PEEK, a witness on behalf of Plaintiff, testified:

Direct examination.

By Mr. MacLane:

Frank W. Peek, No. 35 Waverly Street, Pittsfield, Massachusetts, age 50. Electrical engineer employed by the General Electric Company at Pittsfield, Massachusetts. I am Chief Engineer of the Pittsfield plant. The Pittsfield plant of the General Electric Company is devoted primarily to designing transformers and other apparatus for transmission lines, and also do the main research work in connection with transmission. We have, for instance, a five million volt laboratory for studying advance transmission problems, and employ about seven thousand men. I have been [fol. 242] interested in connection with the development of the art of transmission for many years, particularly in research work.

I graduated as an electrical engineer from Stanford University in 1905. After graduation, I went with the General Electric Company, in the student course, at Schenectady, where later I became consulting engineer with the late Dr. Steinmetz. Later, when the high voltage research and transmission work was transferred to Pittsfield, I was transferred there, to be in better contact, particularly with the high voltage research laboratory. I might say that while I was in Schenectady, I was given a degree as Master of Electrical Engineering by the Union University. My first work at Pittsfield was connected with research on all

kinds of high voltage, and particularly with transformers. In 1927, I was made Chief Engineer of the transformer department of the General Electric Company, located at Pittsfield, and held that position until the first of the year 1931, when I was made Chief Engineer of the Pittsfield works. All that time, I retained my interest in the laboratory, still taking personal charge of that work. In that laboratory, we have produced voltages up to five million volts. I also have inventions relating to high voltage transmission which are utilized by the General Electric Company. I have published papers and books on the subject of transmission and transformers so that the information which we gathered at the laboratory could be utilized throughout the world in designing electrical transmission lines and apparatus. I believe it has been. The name of the book is "Dielectric Phenomena in High Voltage Engineering." It was first published, I believe, in 1915, and has gone through several editions. It has been translated into practically all languages, but not all authorized editions. I am the author of probably 100 or more papers which have been published in technical magazines on these subjects.

I received the Thomas Fitch Rowland prize from the American Society of Civil Engineers, for work on transmission. I received a similar medal, the Levy Medal, from the Franklin Institute in 1926. I am a Fellow of the American Institute of Electrical Engineers, a Fellow in the [fol. 243] American Association for the Advancement of Science, a Fellow of the American Physical Society, and also a member of the Franklin Institute. I am a director of the American Institute of Electrical Engineers, and a representative of the American Institute of Electrical Engineers on the National Research Council. I have at times been Chairman of the Research Committee of the American Institute of Electrical Engineers, and also the Electrical Physics Committee, and have served on various committees having to do with electrical transmission and transformers.

I am the author of the article on Transformers in the 14th Edition of Encyclopedia Britannica.

Q. In your testimony, we are going to discuss some of the problems involved in the transmission of electrical energy, including the part played by transformers in that

process. Preliminary to that discussion, we will require the definition and explanation of fundamental electric concepts. Will you please define electricity, so far as it can be defined?

A. Electricity is a subtle imponderable physical agency manifesting itself in certain known ways. While the essence of electricity may be considered as yet somewhat obscure, its laws and characteristics are so well known by the electrical engineer as to enable him to design electrical apparatus and predict their performance with great precision. In speaking of electrical matters, the word "electricity," is used popularly very loosely as applied to a variety of factors which are fundamentally different and should be carefully distinguished, such as electric current, voltage, power and energy.

Electricity may be in rest or in motion. Electricity in motion constitutes electric current. Electric current has a number of distinctive characteristics.

First. The flow of electric current differs from the flow of fluids, in that an electric current always makes a complete unbroken circuit. For instance, as much electric cur-[fol. 244] rent flows back into a generator through one terminal as flows out of it over the other terminal. In this respect, the flow of an electric current is somewhat like the motion of an endless belt.

Second. As may be inferred from what I have just said, electric current is not retained or consumed by the electrical loads on a circuit. For instance, as much electric current flows out of an incandescent lamp to a generator, as flows into it. Electric current is never bought or sold. The popular expression of "buying electric current" is a misnomer, the correct expression being the "buying of electrical energy."

Third. Practically any magnitude of electric current can be set up, or induced if desired, with practically no power or energy associated therewith. An electric current, as such, has therefore no monetary value.

Fourth. Electric current is associated with electrical energy as a vehicle for said energy, but such association, or later disassociation, does not alter the magnitude or na-

ture of the electric current. Current measuring instruments cannot distinguish between a current associated with energy and that which is not so associated.

Fifth. Electric current is measured in amperes, while electric energy is measured in kilowatt hours—two distinct quantities, not convertible into each other, nor expressible in terms of each other.

Electric voltage, called also electric tension, and electric motive force, is a state of electro-magnetic medium somewhat analogous to mechanical pressure. Some of its distinctive characteristics are:

First. Electric voltage, somewhat like mechanical pressure, is exerted between two or more points, as between the terminals of a generator, between the wires of a transmission system, between the terminals of a socket, or between the terminals of an incandescent lamp. It does not circulate, like electric current, neither does it flow.

[fol. 245] Second. Electric voltage can exist without being associated with electric current or with electric power or energy, similar to the possibility of mechanical pressure being maintained without motion taking place or work being done. Wires or electrical apparatus are spoken of as "alive," when there is electrical pressure or voltage on them. A live wire need not be conducting any current or transmitting any power.

Third. Electric voltage, like electric current, is a necessary vehicle for electrical energy, but it is not the same thing as energy. Voltage is measured in volts; energy in kilowatt hours, and the two are not convertible into each other or expressible in terms of each other. Voltage that is associated with energy and that which is not so associated, cannot be distinguished by any instruments for the measurement of voltage.

Power manifesting itself through the instrumentality of electric voltage and current is known as electric power.

Electric power in a circuit is proportional to the product of simultaneous magnitudes of current and voltage in that circuit. Current alone, or voltage alone, is not an adequate vehicle for electric power, but their simultaneous presence is necessary.

Electric power flows from a generating point to a point of utilization. It does not circulate like current, but is absorbed or consumed by the load, by conversion into another form of power, as, for instance, mechanical power in a motor. In a circuit that is alive with voltage or tension but otherwise inactive, with no power flowing, power flow is initiated at a load point, not at a generating point. For instance, when an electric lamp is turned on, an influence corresponding to demand for electric power appears instantly at its terminal and extends to the generating station. The time required for this influence to reach from the load point to the generating point is so infinitesimal that the two events are for all intents and purposes, simultaneous and integral, but the control and initiation of power [fol. 246] rests at the load. Power cannot be transferred through a generator unless it is initiated by a load.

The physical path of the flow of power between two points is always absolutely continuous, without any gap, regardless of any intermediate apparatus. For instance, in a hydro-electric system, the power of falling water follows an unbroken path, passing to the turbine blades by contact, thence through the turbine shaft to the electric generator, through the generator into the line, thence through transformers in the line to the customer's load.

Electric power used through a period of time is known as electric energy. It is measured in kilowatt hours, and is bought and sold as an article of commerce.

Electric energy is not the same thing as electricity, even though in popular parlance the two are used synonymously. Electricity is merely a medium or vehicle for energy in electrical form. Technically, electricity is measured in coulombs, while electric energy is measured in kilowatt hours—two units of altogether different category, not expressible in terms of each other—electricity by itself has no monetary value.

Energy cannot be created or destroyed. It can, however, be converted from one form into another form. When we say that energy is "absorbed," or "consumed," or "utilized," what is taking place is its "conversion" from one form to another. Such "conversion" of energy, however, does not imply a change in the nature or essence of energy,

but merely its transference from one type to another type, as for instance, from an electro-magnetic to mechanical, through the instrumentality of an electric motor.

The essential apparatus interposed in an electrical system to accomplish the transfer of energy from a source in nature, such as falling water, to the place of use, are generators and transmission lines. Transformers may or may not be used. As a matter of fact, they are usually used. [fol. 247] A generator is an instrumentality whereby energy may pass from a mechanical medium into an electrical medium. A generator does not in any sense generate or produce current or electricity. It does not generate energy. It can be said to generate an electrical tension or voltage, that is, a certain state of electrical medium whereby it becomes possible for electricity that is already dormant to get into circulation, and whereby it becomes possible for a useful load to draw energy from a distant waterfall.

The function of a transmission line is a link to maintain the energy path between the waterfall and the consumer.

An electrical state is characterized with voltage and current. Different types of circuits require different values of voltage and current. Transformers are electrical links, making it possible to connect circuits of different voltage and current with each other. The real reason for using a transformer is an economic one; that is, they are not a necessity.

A transformer consists of two or more windings coupled by a magnetic core, and insulated by a strong dielectric. The current and voltage of each winding are separate from those of the other winding or windings, but, by virtue of their coupling, current and voltage in one winding are said to induce corresponding current and voltage in another winding. Thus, if the switch of a load is closed, permitting a current to circulate in it and the transformer winding connected to it, this current induces a corresponding current in the winding connected to the generator, and a current flows through the generator.

Insulation which separates the windings connecting the generator and load, respectively, is completely permeated by the intense electric and magnetic lines of force. Power entering one winding passes into this insulation through

electro-magnetic fields, then into the other winding, and from it to the connected apparatus. It is important to realize that although electric current cannot flow through the insulation of a transformer, electrical energy does flow right through it with perfect ease. An analogy may be [fol. 248] helpful. The walls of the tubes of a boiler in a power house segregate or insulate the water and steam from the coal and its flames and smoke. But the heat energy of the burning coal passes readily right through the walls of the tubes to the water.

The role which a transformer plays is similar to that of a set of reduction gears. Each gear has its own rotation (corresponding to electric circuits) separate from those of the other gears. Each gear has a different velocity (corresponding to current) and pressure (corresponding to tension) from those of the other gear. But energy flows from gear to gear without a break or gap in its path.

A transformer then transforms current and voltage, not power or energy. The latter flows right through its insulation without alteration.

The function of an entire hydro-electric system is to establish and maintain a free path of communication for energy between the waterfall and the consumer's premises, whereby consumers may be able to draw power as energy from the waterfall at any time and in any reasonable quantities that they may desire.

Energy is not manufactured, stored and shipped—it is merely transmitted through a sequence of different types of conveyances including hydraulic, mechanical and electrical branches.

Q. What is it, speaking in electrical terms, such as you have used them, that is delivered by means of such a system to the consumer and used by him?

A. Energy.

Q. And that is the same energy that is in the waterfall?

A. Yes.

Q. Does the consumer use in his ultimate use, energy in electrical form, or in some other form?

A. In some other form. For example, the operation of a motor to in turn operate, or rather make motion in the [fol. 249] machine possible (mechanical energy); in the case of light we use energy to produce light (light energy), or

in the case of an electric range we use energy to produce heat (heat energy). In a light a considerable amount of energy is used as heat. In the case of light the consumer does not use electricity, he simply uses energy that it conveys. In the case of refrigeration, the energy is applied in practically the same way. Mechanical motion operates and performs what is necessary—that is the first step in mechanical energy—rotation.

The electrical system, including all of the various parts, has no other useful function than to transfer energy from its origin to the place of desired use.

Electrical energy is measured by watt hour meters, and is expressed commercially in terms of kilowatt hours.

Q. While I believe you have already stated, I shall ask you expressly, does the consumer receive or use electrical current?

A. He doesn't use electrical current. The same amount of current that flows into his device, whatever it is, flows out of it. He does not use electric current, and his meters will not tell whether that particular electric current is conveying energy or not. It has the same reading both in and out.

He does not receive or use voltage as such.

The power or energy used by the consumer is not different or changed through the intervention of transformers from that which passes through and reaches the generator?

Cross-examination.

By Mr. Barber:

Consumers could get heat from the use of coal, or the burning of gasoline or gas, and could also get light from burning gasoline. And you can get mechanical work by using combustion motors.

There is a decided difference there—in these cases you are dealing with material substance.

[fol. 250] Q. With the use of the electric system, we have greater facility in the use of devices by the consumer than is true with energy that is made by the burning of coal or gasoline? From his own point of view, he gets light immediately when he presses a switch, not having to take the

time to strike a match, or adjust a gasoline lamp, for instance?

A. Yes. That is some of the advantages of electricity.

Q. You could transfer the energy in the falling water by transferring the water to another point, where you could get the motion in the water?

A. You do get energy out of water—it is the energy that is brought to the consumer—it does come from falling of water—is that what you mean?

Q. Yes—if you could flume the water to another point, the water energy might be utilized there?

A. It is possible. I would have to know the circumstances.

You can transmit the mechanical energy that is in the turbine shaft through mechanical agencies to the point of use. It is physically possible to transmit it a considerable distance that way. It is economically cheaper to transmit electrical energy than mechanical energy over any considerable distance.

Q. When we speak of energy in the falling water as the same energy, no doubt we must distinguish in a practical way to this extent, that it is in a different state or form when it flows to the generator, than after it flows from the generator?

A. Well, of course—we are getting on philosophical grounds here, but it is the same energy. The energy is from the water, and it is the same energy that was in the water that the consumer uses.

Q. When you speak of generation, generation is necessary in order to have transmission of it over the electric circuit?

A. That is what I am trying to bring out—we do not generate——

[fol. 251] Q. Using the term which is generally used in electric industries?

A. I do not thinks so.

Q. You would say that it is unnecessary to use that mechanical device which we call the generator in order to transmit the energy over the wires?

A. Well, I wouldn't say that—we must use some device.

Q. Through the operation of that device, you transform or convert energy from one state to another?

A. I would say that the transfer is from one vehicle to another.

Q. Does it have any different physical characteristics?

A. Not the energy.

Q. It manifests itself in different forms?

A. Yes. It does.

Q. Would you have to use the generator in order to utilize the electric circuit that exists in electric devices that are attached to wires in the transmission and distribution lines?

A. Yes. There is some similarity, perhaps, between the operation of the generator and the transformer; if I were starting the industry, I might call the generator the transformer. That is because its function is to transform energy, or make it available so that it can be transmitted over the transmission line. In the transmission, the transformer is not at all necessary. We could build a generator to get as high voltage as we wish, but it happens that it is easier and more economical to do it with a transformer. A transformer in that way is analogous to the gear system I have suggested. It is a gearing device, that is all, and does not interpose any obstruction to the energy. The energy flows right through the same as it would through here. The transformer does not change the energy at all.

Q. We will consider the plaintiff's system that generates [fol. 252] 2300 or 6600 volts—it would not be practicable to transmit that with that voltage any distance over their wires?

A. It depends. I do not know what you mean by distance.

Q. 100 miles.

A. Any such distance we would wish high pressure. The transformer is just an economical measure to reduce friction losses.

Q. Otherwise, you would have to use a large conductor?

A. Yes. Technically, there is no reason why we couldn't use 2300 volts as well as higher voltage, but it would cost tremendously more, that is all, if we consider a large amount of energy involved. Mechanical devices are constructed for the utilization of energy to certain voltage with slight variations permitted.

Q. A device so constructed as to utilize the 2300 or 6600 volt current which came from the generator could not be

connected to the 130,000 volt current upon the other side of the transformer used in connection therewith?

A. It might be, but there would be no reason for doing that. If we wish to connect with that voltage, we can easily calculate what is necessary, and design for that purpose./

Q. Would you say it could be used?

A. It might, not perhaps economically, but the point is that we wouldn't use it that way. We would design a device, which we could do with close precision.

Q. Assuming that a motor is so constructed that it can be directly connected with a line which comes from a generator generating 6600 volts. You wouldn't attach this same motor intentionally to a 130,000 volt line?

A. No. If I wished to use a motor connected directly with that line, I would design a motor that would function with that line.

Q. A motor designed for 6600 volts or 2300 volts would either burn out, or something would disrupt the transfer of energy?

[fol. 253] A. Yes. Just the same as energy through a shaft, I probably might want to have a gear system corresponding to some particular use. By designing for the proper volts, if it has the same power rating, it takes the same energy from the line without change, from the waterfall.

Q. You spoke a moment ago of lamps. For instance, house-hold appliances designed to utilize 110 volts. You couldn't connect those directly with either 2300 volts or 6600 volts?

A. They wouldn't last very long. It would be foolish to do such a thing. In either case, if designed to take a certain amount of energy, that energy would be the same energy coming from the waterfall.

Q. One thing I didn't understand. You spoke of the entire system as merely a device for transferring energy from the falling water to the consumer?

A. Yes.

Q. You do not transfer all the energy, however, that is generated by the turbine shaft?

A. No. Nothing in nature is 100% efficient, and a certain amount of energy is required to keep the system going.

Q. Ordinarily called losses?

A. Similar to friction losses. We have it in all machines, I might say, however, that it is probably less in the electrical system than in any other.

Q. Is there not more by using the electrical system than merely mechanical energy in some instances?

A. Possibly in some instances. It is hard to generalize on these things. The best transformer, for instance, is 99½% efficient.

Q. In addition to losses in the generator and transformer, you have line losses?

A. Yes. In the transformer, we have losses in keeping the transformer in operation. I do not believe I emphasized [fol. 254] this loss, because it is so negligible and immaterial.

Q. Speaking of the consumer using energy in another form, such as heat energy, or mechanical energy,—he does buy and receive electrical energy, however?

A. I wouldn't say so. He wouldn't care if some other vehicle brought it to him, if it were just as convenient to him. He buys energy, and that does the work.

Energy is what does it. He is not interested in the mechanism necessary.

Q. In these different devices that are attached to the electrical system, it is electrical energy that is bought and sold?

A. Energy is bought and sold.

Q. Wouldn't you say electrical energy?

A. All he uses—it does the work—perhaps we are playing on words. The facts are, he uses the energy of the waterfall. What vehicle brought it to him is immaterial to him, except that as to certain devices constructed to take it from the vehicle it is more convenient.

Q. I had this question in mind. In common practice—at least the company's monthly bills to him show whatever he pays upon the meter readings.

A. Yes.

Q. And that meter measured the amount of electric energy consumed to that point?

A. It measures energy expressed in kilowatt hours.

Q. Isn't that the expression which we employ in connection with electric energy?

A. Yes. But instead of kilowatt hours, I could make the meter read h. p. hours.

Q. It doesn't require electrical energy to cause that meter to register the way it is constructed?

A. Yes. It is so constructed. I might use an electric meter to measure something else. I would use a different [fol. 255] type of meter. It is just a matter of convenience, that is all.

Redirect examination.

By Mr. MacLane:

Q. I understand from your testimony that the real reason for the transfer of energy through the electrical medium, by so-called electrical facilities, is to facilitate the transfer, isn't it?

A. Yes. That is the vehicle, in other words.

Q. Could we transfer energy over any appreciable distance by some other means, and accomplish the same results that are today accomplished by the transfer of electric energy through appliances adapted to other forms of energy, such as for example, mechanical energy?

A. I might say for instance, instead of going through the electrical form or the electrical path or vehicle to carry energy—I might use a shaft, if that is what you have in mind, and transmit mechanically from that waterwheel to some distant place at which the energy might be utilized without going through the electrical phase at all. For instance, I might cook with it.

Q. Could you transfer energy mechanically, and at the point to which it is transferred acually use it by converting it into heat energy for cooking?

A. I might for instance, have a water turbine, just a waterwheel—the energy of the waterfall would pass through the turbine blades to the shaft. The shaft would turn, and I might have a pulley on that shaft. Now, on that pulley I might have a belt going to another shaft at some distance, and that shaft at the distance be turning. That shaft at the other end might, for instance, go into a tank of water, and by friction or rubbing, might produce heat which might be used in cooking. Now, I might put on what corresponds to a transformer in that system. Instead of going directly from the steel pulley or waterwheel shaft, I might go

through from that pulley to a countershaft, and have another pulley on that shaft to get different speed. You would [fol. 256] then get the transformer effect. You could convert that energy in a mechanical form into heat. You might do the same thing electrically by using a generator, a transformer and transmission lines. You might even produce light that same way, but I am not saying that I would do it. I am just saying what could be done.

Q. And methods of doing so are known to scientists; the losses, however, would be much greater than if transferred through the electrical system?

A. Generally speaking, that is true of other uses to which so-called electric energy is put.

Q. Now, you have said that the whole system is constructed essentially to more efficiently accomplish the transfer of energy. Is that true of such parts of the system as the transformer, for example?

A. Yes. In fact, the transformer in effect makes part of an energy highway—makes the highway better for the transmission of energy.

What we call in electrical parlance, kilowatts, is merely a measurement of energy.

A kilowatt may be readily translated, into horsepower.

Approximately three-fourths of a kilowatt equals a horsepower.

Similarly, a kilowatt hour may be translated into terms of mechanical energy. Horsepower hours, it might be called. After all, these are merely mechanical expressions of the ability to accomplish work. What the customer really wants is something to do work, and that is what he pays for, if I may get a little bit commercial.

Q. I think a question was asked by counsel for the State regarding the difference in appearance between a revolving shaft and an electric transmission circuit. Does that represent a difference in energy, or a difference in the vehicle, as you have called it, for the transference of that energy?

A. Merely a difference in the vehicle. The ability to do [fol. 257] work will be the same; you can't see the energy in either case.

Recross examination.

By Mr. Barber:

Q. You spoke of transmitting this energy by means of a shaft and pulley. It would be practically impossible to transmit that a distance of 100 or 200 miles?

A. I wouldn't say that it would be impossible, but with present bearings, and so forth, it wouldn't be very efficient.

Q. Through friction losses, only a small percentage of the power would reach the terminal?

A. Probably. There may be other reasons, like expense.

Q. While it is physically possible when energy is transmitted in such fashion, to obtain heat and light from it, you couldn't adapt it to the present devices which we use in our home or shop or office, without the interposition of a generator? I mean those lamps, and electric heating stoves and cooking stoves?

A. I didn't mean to convey that impression. These are naturally developed to take the energy conveyed in the electrical vehicle. Now, if we wish to convey in some other way, that same water power energy, we would design some other devices for that.

Q. Does science know today how to operate a radio or x-ray by any other means than by electric energy?

A. Why, probably not as it has developed, but we might use, for instance, light instead of the ordinary radio ray, but on the other hand, we may look at light as an electro magnetic phenomenon, too.

Redirect examination.

By Mr. MacLane:

Q. I find in your direct testimony you describe energy, or electric energy, as an article of commerce. Will you explain that sentence?

A. I mean that energy as distinguished from current and voltage is what the company gets from nature—transfers it [fol. 258] to the consumer and what the consumer pays for. I do not mean to attribute to it properties of substance or matter.

Recross-examination.

By Mr. Barber:

Q. Science doesn't know any connection between energy and matter?

A. Perhaps—there are various theories. I think it would be too deep to get into here.

Q. Isn't it considered, however, a matter of question as to whether or not ultimately we will be able to show that all matter is made up of energy?

A. I do not know. That is speculation, of course. We have lots of theories and speculations. I think the best theory is that those are not the same. I do not believe you could call them the same by any stretch of the imagination.

Mr. MacLane: The plaintiff rests.

Defendants' case.

Mr. Barber: We offer in evidence Defendants' Exhibits Nos. "F" to "P", both inclusive, the same being certified copies of water license permit granted to the plaintiff by the State of Idaho, relating to the use of certain water power in the streams of Idaho for the generation of electric power by the system. I understand that it is agreed that these be considered identified.

Mr. MacLane: Reciprocating Mr. Barber's courtesy, we agree that these may be offered without further identification. We further agree that they may be offered to the same force and effect as if offered before the court, and waive any objection based upon the grounds that they are not included within the order of reference. Subject to the foregoing agreement, we object to their receipt in evidence, on the ground that they are incompetent, irrelevant and immaterial to the issues involved in this case, in that they lend no support to the tax which is under attack, and have no [fol. 259] bearing upon the question as to whether such tax is or is not a burden upon Interstate Commerce.

Typical of above exhibits is Exhibit No. — which is as follows:

[fol. 260] EXHIBIT IN EVIDENCE

2790

State of Idaho

License and Certificate of Water Right

Water License No. 10009. Amount 700 sec. ft.
Water District No. 36-A. Priority 12-20-1913.

This is to certify that Utah Power & Light Company of Salt Lake City, Utah, made application for a permit to appropriate the public waters of the State of Idaho, dated December 20, 1913; that Permit No. 10009 was issued under said application; that Certificate of Completion of works, with a carrying capacity of 700 second feet, was issued thereunder on March 16, 1921, showing that said works were completed on the 18th day of September, 1920; and that on the 18th day of September, 1920, Utah Power & Light Company of Salt Lake City, State of Utah, made proof to the satisfaction of the Commissioner of Reclamation of Idaho, of the right to use the waters of North Fork Snake River, a tributary of Snake River, for the purpose of generating power, under Use Permit No. 10009 of the State Engineer and that said right to the use of said waters has been perfected in accordance with the laws of Idaho, and is hereby confirmed by the Commissioner of Reclamation of Idaho and entered of record in Volume 5 of Licenses, at page 2790, on the 16th day of March, 1921;

The right hereby confirmed dates from December 20, 1913;

The Point of Diversion is located N. 9° 50' E. 2045 feet to N.E. Cor. Sec. 1, in the SE¼ of NE¼, Sec. 1, T. 7 N., R. 40 E. Tp. 7 N. R. 40 E. B. M. County of Fremont.

That the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually needed and beneficially used for said purposes, and shall not exceed 700 cubic feet per second.

Description and location of use:

That the place of use of said water is at the St. Anthony Power Plant, located in the SE¼ NW¼, sec. 1, T. 7 N., R. 40 E. B.M.

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, as provided by the laws of Idaho.

Witness the seal and signature of the Commissioner of Reclamation, affixed at Boise, Idaho, this 16th day of March, 1921.

W. G. Swendsen, Commissioner of Reclamation.
(Seal.)

[fol. 261] Mr. Barber: May it be stipulated that subject to any objection of the plaintiff as to the character of the evidence offered, a competent witness, if now produced at this hearing by the defendant, would testify to the effect that practically all electrical energy generated in the State of Idaho is generated by the employment of power in falling water, and such witness may be considered as so testifying, subject, however, to the objections of plaintiff.

Mr. MacLane: Without conceding its materiality, we agree that that is a correct statement of fact, except for minor industrial uses which are not subject to the Tax Act, and a witness may be regarded as having so testified.

[fol. 262] Carl Edward Magnusson, a witness on behalf of defendants, testified:

Direct examination,

By Mr. Barber:

Carl Edward Magnusson, age 59, residence 5200 16th Street, N. E., Seattle. I am a professor in electrical engineering, and director of the Engineering experiment station at the University of Washington. I received a B.E.E. Degree from the University of Minnesota in 1896, Master of Science in 1897 and of Electrical Engineer in 1906. I studied under Dr. Steinmetz at Schenectady, New York, in 1911 and 1912.

I was Professor of Physics, University of New Mexico, 1901 to 1903; New Mexico School of Mines, 1903 to 1904. I was with the General Electric Company in 1911 and 1912, and with the Westinghouse Electric & Manufacturing Com-

pany, Pittsburgh, Pa., in the summer of 1917. I was Consulting Engineer for the American Nitrogen Products Company in 1917 and 1918. I have conducted a number of tests and reports on engineering projects in the past 35 years. I was Associate Professor of Electrical Engineering in the University of Washington in 1904 and 1906. I was Professor and head of the Department of Electrical Engineering in 1906, and Dean of the College of Engineering, from 1917 to 1929. I was director of the Engineering Experiment Station from 1917 to date, and Chairman of the University Research Society from 1920 to date. I was a member of the American Committee, World Power Conference (London) in 1924, and in 1930. I did consulting work for the General Electric Company in the summer of 1926, 1927, 1928, 1929 and 1930.

I am a Fellow in the American Institute of Electrical Engineers, and was Vice-President from 1920 to 1923. I have been Chairman of various committees. I am a Fellow in the American Physical Society, and the American Association for the Advancement of Science. The others are not technical.

I have published three books. One on "Alternating Current," now in its fourth edition—another entitled "Direct Current," and another "Electric Transients," in its second edition.

[fol. 263] I am the author of some forty technical papers. My work in electrical engineering has been devoted to instruction in electrical engineering which implies that the work must be given in the practical phase as well as in the theory.

The generator is a machine or device for converting or changing mechanical energy to electrical energy, or energy in the mechanical form to energy in an electrical form. Take the large generators concerned in this case, the magnetic field is placed on a rotor, and surrounded by conductors through which the current can flow to the transmission line. By rotating the magnetic field the magnetic lines of force cut the conductors and generates voltage.

Q. Is there any particular voltage that is inherent in generation?

A. No. It is the rate of cutting lines of force.

Q. Determined by what?

A. It depends upon how strong the magnetic fields are,

how many conductors in series, and what speed or rotation, or it can be expressed in the single sentence, the rate of cutting lines of force. Different generators may generate different voltages. That will depend upon the strength of the field, the number of lines of force which cuts the number of conductors in series, and that will be expressed by the rate of cutting lines of force. These are dependent upon generator design. The amount of electric energy generated is measurable with a high degree of accuracy, after it has left the generator. In an electrical system, consisting of generating stations, transmission lines, and distribution network, the amount of electrical energy reaching any given point upon that system is capable of definite ascertainment. We can measure the flow of energy passing any point in a transmission system if we attach the proper instruments. In any system there are some losses. There are system losses, hysteresis losses, and so forth, corre- [fol. 264] sponding and quite similar to friction losses in a mechanical machine. These losses in the generator—the friction of the bearings, those due to magnetic hysteresis, and what is called copper losses, due to the resistance in the conductors. There are likewise transmission line losses—the copper losses.

Q. Generally, in the electric industry are those referred to as losses or uses?

A. Losses, that is what the engineers use.

The transformer consists of two windings—a primary winding and a secondary winding, both interlinked by an iron core. When the current flows in the primary winding, a magnetic field is set up in the iron core. The magnetic lines of force cut the secondary winding, generating or inducing electromotive force. The ratio in the relation between voltage in the primary and secondary winding is approximately the proportion to the number of turns in the two cases.

Q. Is there any similarity in the action of the transformer and that of a generator?

A. The voltage induced is in both cases produced by conductors being cut by lines of force. In the generator, the conductor is stationary, and the magnetic field, in the large type of generators, is moving which is also the case with the transformer.

In smaller generators, the fields are usually stationary, and the armature rotates, and the reverse condition of having the fields stationary and the conductors moving is present. But in all cases the magnetic induction produced is merely the relative motion of the conductor with respect to the magnetic lines of force.

Q. I understand that in neither the generator or the transformer are the two parts connected by metallic conductors, or like physical matter?

A. No. In the transformer, there is sufficient insulation between the primary winding and the core and the secondary winding and the core, so that there is no path through which the current can flow between the primary and the [fol. 265] secondary winding. The energy transfer is made magnetically. In the alternator, either the field or the armature conductors move, and there is, aside from the insulation, between the conductors and the iron core, an air gap, so that the current cannot flow between the field circuit and the armature circuit in an alternator.

Q. Does the electric energy which goes from the transformer over the transmision line have any different physical characteristics than the energy flowing from the generator to the transformer?

A. The electric energy is expressed by the product of the current, the voltage and time. If we have a transformer at the generator station and we step up the voltage then on the generator side, the current would be larger than on the transmission line side, and to compensate for this changing current, the voltage will be correspondingly higher, on the transmission lines than on the primary windings connected to the generator.

Transformers are used to raise or lower the voltage with corresponding decrease or increase in currents. Decrease in current reduces the line loss.

If energy is generated at 6600 volts, it is possible to transmit the energy at that voltage; but not economically for any long distance, say a hundred miles. The losses in the electrical system are substantial in amount. If we take merely the copper losses, they will vary as to the square of the current, and having the voltage constant will vary as to the square of the power or energy delivered. The relation of the other losses is not so readily stated.

I suppose in some cases the loss might exceed the amount of energy delivered to consumers but that would be a very poorly constructed system. The amount of energy delivered to a consumer is dependent upon the character of construction of maintenance of the system. The relative amount of losses at various parts of the system can be determined under given conditions.

On an A. C. system energy can be stored in a condenser. [fol. 266] The quantities held in a condenser are small, and would not serve, in the sense of ordinary storage, to carry the load.

Cross-examination.

By Mr. MacLane:

The source of energy which is transferred by an electrical system is in nature and already existing external to the system.

Q. As the system is really interposed for the purpose of transferring this energy from its source to the place where it may be usefully put to work?

A. Transferring and converting. You convert it to facilitate transfer and use.

Q. As a matter of fact the whole system, whatever you call its different parts, the generator, the transmission line, the transformers, both step-up and step-down, the distribution lines and the consumer's motors or other consuming devices, are all linked together and inter-related for the purpose of accomplishing this transfer and delivery in such form as the consumer can use it.

What the consumer uses in his appliance is energy—in the case of light it is heat energy—and in the case of a motor it is mechanical energy, and in some cases chemical energy, and so on.

Q. The whole thing depends, as I believe you once said in your book on alternating currents, considerable of which I have read but only the introduction to which could I understand, that the principle of the conservation of energy is the fundamental assumption and the basis upon which the argument sets?

A. Correct.

Q. And you further state in that introduction that electric energy is the connecting link or chain by which energy can be economicaly transmitted and effectively controlled?

A. Yes.

Q. Now, I find one other interesting statement in the book on "Electric Transients," which is even more incom-
[fol. 267] prehensible to me than your book on alternating currents. On page 163 of that book you state, "In commercial systems the transmission line is not an independent unit, but merely a link between the generator and load circuits. Step-up and step-down transformers, generators and load circuits, lightning arresters and regulating devices, and all the apparatus necessary for the operation of the system are electrically inter-connected into one unit." I suppose you still subscribe to that statement?

A. I think so.

Q. After an electrical system has been constructed, but before any consumers are connected with the lines, the generator remains idle, does it not, even though water may be passing through the turbine, assuming that it is excited? That is to say, the system itself consumes, if I may use that term, some of the energy which is transferred through the generator, and uses it for the purpose of magnetizing the transformers and to compensate the resistances in the system, and like uses, and after you connect consumers to this system the generator then commences to perform its functions commercially?

A. Yes.

Q. And really from that time on and thoughout the life of the system the generators are effectively controlled by the consumers in their aggregate demand?

A. They are controlled through a system of well conceived regulating devices.

Q. But the so-called output of the generators is a function entirely of the consumer's load, subject to these uses or losses?

A. The consumer's load actuates the controlling devices, and they control the generator and the turbine.

Consumers' devices at one end and generator at the other end must operate substantially integrally and synchronously in point of time to produce the desired result. [fol. 268] With respect to the uses or losses in the system, it is true that the system itself impresses on the generators

a demand similar, so far as the generators are concerned, to the demands of consumers to satisfy these uses or losses. And the generator, if you can imagine it as a sentient being, does not distinguish in performing its functions between the load that is created by the consumer and the load that is created by those so-called losses.

Meters at the generating station, or what the statute which we are considering in this case calls "The place of production" are placed outside the generators, and that is the first place at which the energy transferred through the generators may be measured.

While possibly for laboratory purposes you might measure it somewhere else, yet commercially it cannot be measured until that time.

With respect to that energy which reaches the consumers, it is all in course of transit to consumers or, in fact, is being simultaneously, for practical purposes, received by them at the time of the measurements. These meters measure the energy flowing past the point at which the meter is connected. The measurement is in terms of kilowatt hours which is the unit for measuring electrical energy.

Q. And that, of course, is a well-known mathematical expression of energy relationship—as a matter of fact, if you change the dial of the meter, you could record that measurement in horsepower?

A. By changing the calibration you could record it in any unit you pleased. In fact, you could even measure it, by proper change in calibration and expressions on the dial in British Thermal Units.

Q. Now, after all, this measurement is merely a mathematical expression of energy in a convenient form?

A. Not only mathematical, but commercial—practical.

The consumers' motors or other appliances must be de- [fol. 269] signed and adapted to the voltage of delivery of energy, so that you could not effectively use a 6600 volt motor on, we will say, a 44,000 or 130,000 volt transmission line.

Q. These motors used by consumers to reconvert the energy from electrical to mechanical form and put it to work were once called dynamos?

A. Yes. Dynamo is probably a term that is rather loosely used, but I think is generally accepted as a name for both motors and generators.

Q. We used to call generators dynamos?

A. It is something in the same situation as the term "Electricity" is used. It is quite frequently used loosely.

The construction of both generators and motors is very similar.

Q. And speaking approximately, if you had a thousand kilowatt generator at one point and a thousand kilowatt motor at another, you could operate the system in either way, by putting the prime mover back of the generator in one case, and back of the motor in the other?

A. Hardly in alternating currents. In direct currents that might work to fair advantage, but hardly in alternating currents. There is too much difference. However, the functions of the generator and of the motor are the same, namely: that they are devised for what we will term the conversion of the energy between the mechanical and the electrical forms. The process of the alternator or the generator, converts mechanical energy into electrical energy, while the motor reverses the process and converts electrical energy into mechanical energy. Neither the generator nor the motor creates energy. In fact, it is fundamental law of physics, that energy cannot be created or destroyed. That is the basis of our whole electrical engineering science.

A generator does not create electrical energy. Generation does not mean creation. It does generate voltage, and using the term in that sense, it becomes largely a matter of definition what you mean by "generator." But it does [fol. 270] not create electrical energy. It is a designation of what happens rather than a description of it.

Energy passes directly from its source through these appliances, notwithstanding the interposition of transformers or anything else, direct to its destination.

Q. It take it that there is no disagreement between yourself and Mr. Peek as to the definitions of electricity and current, as he described them?

A. No.

Q. You spoke of the storage effect of condensers?

A. Storage in the sense of having it accumulate, like water in a reservoir, is negligible, but as far as using it by rapidly storing it and taking it back again, then it need

not be negligible, and is used commercially. For example, in your capacitors' use for power factor correction by placing the condenser or capacitor, which is merely another name for the same thing, at the terminals of an induction motor the energy required to magnetize the motor will be stored in the capacitor during each half cycle, and then returned to the motor so as to eliminate the necessity of having that energy travel back and forth between the generator and motor, and for that purpose the condensers or capacitors are used to a considerable extent.

Q. Yes, but it is, however, an instantaneous charge and discharge?

A. Not instantaneous. It is 120 times a second, but that is not instantaneous. And that is what you might term a "system function"—that is, it is a part of the devices or appliances used in the system to get the energy from its source to the consumer—to insure economical operation. The flow of energy in the electrical form from the generator to consumer is direct, continuous and, essentially, simultaneous.

Q. And while I think it is probably also sufficiently covered by means of the construction of a modern electrical [fol. 271] system containing automatic regulating and controlling devices, to which you referred, the satisfaction of the consumer's demands rests with him, and the impulses set up by him, as closing a switch, without interference by the company?

A. As soon as the automatic regulating devices function in their proper manner that is true.

Q. So the furnishing of power and energy over such a system consists, so far as the company is concerned, in maintaining it at voltage and frequency, and that completes the function?

A. With all of the equipment in proper working condition. That is, if the company maintains voltage and frequency, then it is up to the consumer to get his energy.

Redirect examination.

By Mr. Barber:

We distinguish between electric energy and energy in other forms, generally as having different characteristics and manifestations.

With the proper devices, we could transport energy in the way that you can transport, say, coal and gasoline, and transform that at the place of use into light energy, or heat energy, or mechanical energy.

Q. Would you say that the entire electric system is purely a transferring device?

A. It is converting and transporting. Without that conversion of energy you could not operate the radio set in your home by mechanical energy in the turbine shaft, or the energy in the falling water.

With reference to the theory of conservation of energy, there is also a theory of indestructibility of matter.

Q. Is there any analogy between the change of energy from one form into another and the change of matter from one form into another?

A. Well, you could take water as ice and steam, and as [fol. 272] liquid water, and you still have the same material, but it is in three forms, and ice, water and steam are still the same material substance. I should think a fair analogy might be to say that energy in an electrical form or a mechanical form or heat form would similarly be energy with different characteristics.

Q. When wheat is ground into flour, is there a change in the constituency of the matter that is there?

A. No. If we have wheat and grind it into flour, and make it whole wheat flour, we are merely changing the physical properties and making it a powder instead of lumps or kernels, but still the same material is there.

Recross-examination.

By Mr. MacLane:

The coal and the gasoline contain the energy which is being transported in those cases. And the vehicle for the transportation of coal and gasoline is a railroad car in the case of coal, or in the case of gasoline, perhaps a pipe line, or something of that kind. And the vehicle for the transportation of energy electrically is the electric system. When you are transporting energy in electrical form, rather than in coal or gasoline, you use the electrical system for the agency of transporting.

WELLINGTON RUPP, a witness on behalf of the Defendant, testified:

Direct examination.

By Mr. Barber:

My name is Wellington Rupp; 36 years of age; I live at 921 First Avenue West, Seattle, Washington; Consulting engineer in electrical and civil engineering.

I graduated from the University of Washington with the degree of Bachelor of Science in Electrical Engineering, in 1921, and five years later I received the professional degree of Electrical Engineer.

From 1919 to 1921 I was a student at the University of Washington, in 1920 doing consulting engineering work in [fol. 273] Belgium and France for a period of five months. The latter part of the period at the University of Washington I was engaged as physics instructor at the University.

From 1921 to 1925 I was Assistant Engineer and from September, 1925, to January, 1928, Chief Engineer in the Department of Public Works of Washington, engaged in the investigation of the public utilities of the state of Washington.

In 1924 I was a member of the American Committee at the World Power Conference at London, England. Subsequently I studied power plants in England, Norway, Sweden, Germany, Belgium and France as a guest of these nations.

From January 15, 1928 to date, I have been engaged as a consulting engineer, during which time the work has involved investigations of telephone and electric properties as well as other civil engineering work in the State of Washington, and also a study, over a period of a year, of electric and telephone properties in Japan, Korea, Manchuria, China, Philippine Islands, Dutch East Indies, Straits Settlements, Indo-China, Siam, Burma, India, Ceylon, Egypt, Palestine and some European countries. Subsequently engaged in consulting work in Washington, Oregon and California; also in connection with investigations of utilities.

I am a member of the American Institute of Electrical Engineers; a member of the American Society of Civil Engineers, and of Tau Beta Pi, and the Society of American Military Engineers.

I am familiar with the operation, construction and employment of electrical power systems.

Q. Describe, briefly, the functions of the generator in that system.

A. The generator is employed to convert either the energy of falling water or the energy of fuels into electrical energy. I distinguish between electrical energy and other forms of energy. The mechanical energy has to be [fol. 274] changed into electric energy for use in the electrical appliances.

Q. In the electric system is that change completed at the generator?

A. There would be further changes out over the lines, at the transformers, for instance. It remains electric energy, but it is changed in characteristics.

A generator could be designed to furnish power which could be used in certain appliances. Or devices could be designed to use the power which flows from generators. In other words, transmission for a distance is not necessary.

The transformer is necessary or, at least, desirable in an electrical system to increase the voltage, because it is more economical to transmit electric energy at high voltages than at low voltages.

Q. Is the electric energy flowing from the generator to the transformer impressed with the same physical characteristics as that which flows from the transformer over the transmission lines?

A. I do not know whether I would want to say that it has the same physical characteristic. It has a different characteristic after it passes through the transformer and out on the transmission line. And it is the purpose of the transformer to give it that different characteristic.

Q. Is there any similarity between that change in the transformer and that in the generator?

A. The electrical characteristic of the method of changing is very similar, in that in each case the change resulting

from the operation involves the cutting of lines of force by the conductor, or, vice versa, the cutting of the conductor by lines of force, or the inducing of current in the conductor by the magnetic lines of force.

Q. Is there any similarity between the change in characteristics of energy which takes place in the generator, and the change in the characteristics of material matter in [fol. 275] other processes?

A. I think it would be proper to draw an analogy between the change which takes place in the energy in the generator and other processes, such as taking the cotton from the field. It is made into various forms which are useful. It might be made into calico, or it might be made into the material used in a shirt. It is taking the same material and making it into something which, due to its changed characteristics, is adapted to another use.

Q. Is the full amount of the energy which flows from the generator delivered to consumers for use?

A. No. There are certain losses between the time that it is generated and the time it is consumed. The principal loss would probably occur as a copper loss in the transmission of the energy over the line. There would be a loss—both a copper loss and a hysteresis loss in the transformers.

Q. In the electrical industry generally are these referred to as losses or uses?

A. Losses. I have always heard of it referred to as losses.

Q. Are you able to accurately measure the output of the electrical energy that comes from a generator?

A. It can be measured with practical accuracy.

Q. Can you measure accurately the amount of energy which reaches the transformers and that which flows out from the other side, and the amount delivered to any point on the line?

A. Yes. It can be measured. It is commercially practical.

Energy in the electrical form is delivered up to the point of the appliance, and then it may be converted again into different forms of energy. In the case of running a washing machine they would change it into mechanical energy, and if they were going to put it in a light they would change

it into heat energy and possibly you could say light energy. The meter measures the electrical energy, and the units usually used are kilowatt hours.

[fol. 275½] Q. Generation being accomplished by the utilization in one case of the power of falling water, and in another case by the utilization of burning fuel, there is no distinction between the kind of energy which flows from the generator in either case?

A. No. It would be exactly the same kind of energy. There are certain situations where it is more economical to generate the energy by means of water power, and there are other situations where it is more economical or more desirable to generate the power by steam, using oil or some other fuel as the heat agent.

I am not familiar with the system of the plaintiff, the Utah Power and Light Company except in a general way.

Cross-examination.

By Mr. MacLane:

Q. You referred to some analogy between the change of cotton into calico and from calico into shirts with reference to the electrical process. If you wished to describe this electrical process to a person who did not understand anything about it, you would hardly use that analogy to make it clear, would you?

A. Well, the purpose of that analogy would be to show the manner in which the characteristics are changed. I would use that analogy in showing the change in characteristics rather than describing the process.

Q. It really is not very illuminating as a description of the process, is it?

A. Not of the process, no.

I subscribe to the physical doctrine of conservation of energy.

After all, the thing that exists in nature, and the thing that the so-called consumer wants to use, is energy. We have to adapt the form of energy to our particular needs. And the electrical system is interposed between the source of the energy and the place of its desired use for the

purpose of facilitating its change in form and transfer to [fol. 276] the point of use.

Q. For illustration, if you have a waterfall you will, other things being equal, convert the energy, as you say, into electric energy at that waterfall and transmit it to the point of use, rather than to carry the water from the top of the fall for a considerable distance as mechanical energy and then dropping it through your wheels and conveying the energy at some place of use some miles distant?

A. Well, it accomplishes two purposes. It facilitates the transfer, and it facilitates the use. If I might just clarify that, in some cases it is better to use it in the form of small electrical motors, distributed around a machine shop, and only in the form of electrical energy can it be economically carried into and delivered to these various motors. So the electrical energy is useful for that purpose.

It is also a much more flexible medium for getting the energy from place to place. And if you have several places where you want to use it, as in connection with an ordinary commercial electrical system such as that of the plaintiff, it is much more economical and much more efficient to transfer it just as far as you can in the so-called electrical form than it is to attempt to take a stream of water and divide it into a hundred or a thousand parts and use those parts separately.

The generator, of course, does not generate in the sense of creating energy. It does not create energy.

It may be said to generate a state of electrical tension or voltage.

Q. It is not the voltage that the consumer wants, it is the energy?

A. Well, the energy is a combination of the voltage and the current over a period of time.

Q. The voltage, I think one of the witnesses stated, causes electricity, which is present in nature previously at rest, to be set in motion so as to permit the transfer of energy?

A. I think that it is a little bit beyond me. I believe there [fol. 277] is considerable theory involved there.

Q. You likened the transformer to a generator in certain respects in that, I believe, lines of force are cut in the transformer. That also is true in the motor?

A. That is correct, and, in fact, this path for the transfer of electric energy is not only electrical but also magnetic. And through the gaps of the transformer and the motor the energy travels, in what we may term an electromagnetic path. And these meters to which we referred measure the energy while it is in the course of such transit and also, in fact, while it is actually being delivered to the consumer.

Q. The consumer really initiates the load which is carried on the generator, doesn't he, by closing the circuit?

A. Well, it is due to his closing the switch that certain controlling apparatus is placed in operation, and that results in a variation in the operation of the generators and variation in the load on the line.

He sets up certain impulses which go back to the generator and cause certain actions to take place there—in going back to the control apparatus which controls the governor.

Q. I believe it is implied in what you stated that what the consumer uses is energy—electric energy as distinguished from electric current?

A. Well, it involves the use of the combination of the current and the voltage which use, over a period of time, is the energy.

I do not believe that I could say whether the current itself remains in the closed circuits.

Q. It is just a practical matter. If you put an ammeter on each side of a consumer's motor you would measure the same current, regardless of the intervening use of energy?

A. Yes. You would get the same flow.

Q. It is not one of the purposes of the manufacturer of the shirt out of cotton, or the intervening calico, to convert it back to its former state of being cotton again, is it?

[fol. 278] A. No. That is not the purpose.

Redirect examination.

By Mr. Barber:

Q. You have energy in falling water available to the kitchen sink, do you not?

A. Yes.

Q. Can you use that for the operation of electrical appliances and devices in the home without the operation of a generator?

A. Not without changing the form by means of a generator or some such device.

Recross-examination.

By Mr. MacLane:

Q. As a matter of fact, if you had enough water coming in to the kitchen sink you could put a little dynamo in there and convert it into electric energy right there, could you not?

A. Yes.

Mr. Barber: The defendant rests.

Mr. MacLane: The plaintiff rests.

[fol. 279] STIPULATION FOR SETTLEMENT

It is hereby stipulated by and between the parties hereto, by their counsel, that the foregoing "Statement of Evidence" is true, complete and properly prepared, and having been duly lodged within the time allowed therefor, may be settled and allowed by the Judge of the United States District Court for the District of Idaho, and filed with the Clerk of said Court for use on appeal to the Supreme Court of the United States.

Dated Feb. 15th, 1931.

Hawley & Worthwine, Merrill & Merrill, John F. MacLane, Geo. R. Corey, Solicitors for Plaintiff.
Fred J. Babcock, Sidman I. Barber, Maurice H. Greene, Solicitors for Defendants.

IN UNITED STATES DISTRICT COURT

ORDER SETTLING STATEMENT OF EVIDENCE

Pursuant to the within and foregoing stipulation of counsel, and I having examined the same and being satisfied

that the within and foregoing statement is true and properly prepared, and I having approved of the reproduction of such part of the testimony in the exact words of the witnesses as are so included in the statement,

It is therefore ordered that the same be settled and allowed as a true, complete and properly prepared statement of all evidence introduced in said cause material to the hearing of the appeal thereof, and it is hereby ordered filed as part of the record for the purpose of the appeal.

Dated Feb. 15th, 1932.

Wm. H. Sawtelle. J. Stanley Webster, Charles C. Cavanah, District Judge.

[fol. 280] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

PETITION FOR APPEAL—Filed Feb. 17, 1932

To the Hon. W. H. Sawtelle, Circuit Judge; Hon. J. Stanley Webster, and Hon. C. C. Cavanah, District Judges, sitting as a statutory court in the District of Idaho, Southern Division:

The above named plaintiff, Utah Power & Light Company, a corporation, feeling itself aggrieved by the decree dated February 8, 1932, and entered in this cause on the 15th day of February, A. D. 1932, does hereby appeal from said decree to the Supreme Court of the United States, for the reasons specified in the Assignment of Errors which is filed herewith, and it prays that its appeal be allowed and that Citation issue as provided by law, and that a transcript of the evidence, proceedings and papers upon which said decree was based, duly authenticated, may be sent to the United States Supreme Court sitting at Washington, D. C.

And your petitioner further prays that the proper Order be made and entered fixing the amount of bond and the

security required of it to perfect its appeal and as a supersedeas.

Dated, this 16th day of February, 1932.

John F. MacLane, 120 Broadway, New York City; Geo. R. Corey, Salt Lake City, Utah; Hawley & Worthwine, Boise, Idaho; Merrill & Merrill, Pocatello, Idaho, Solicitors for Plaintiff.

[fol. 281] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

ASSIGNMENT OF ERRORS AND PRAYER FOR REVERSAL—Filed Feb. 17, 1932

Now, on this 16th day of February, 1932, comes the plaintiff, to wit: Utah Power & Light Company, by its Solicitors, John F. Maclane, George R. Corey, Hawley & Worthwine and Merrill & Merrill, and having prayed for an appeal to the Supreme Court of the United States from the Decree dated February 8th, 1932, and entered in the above entitled cause on the 15th day of February, 1932, by the special Statutory Court sitting in the District Court for the District of Idaho, Southern Division, says that said decree is erroneous and unjust to the plaintiff in the following particulars, upon which it will rely upon the prosecution of its said appeal:

I

Because the Court erred in dissolving the Interlocutory Injunction heretofore granted in this cause and ordering the payment of the tax required by the Tax Act described in the Bill of Complaint and in refusing to decree a permanent injunction restraining enforcement of said Tax Act as against the plaintiff.

[fol. 282]

II

Because the said Court erred in finding and concluding that the said Tax Act was valid and in failing to find and conclude that the same was void for the reasons alleged

in plaintiff's Bill of Complaint and as specifically set forth in the following assignments.

III

Because the said Court erred in finding and concluding that the Tax Act, as applied to the plaintiff and its operations, does not impose a direct burden on interstate commerce in violation of Clause 3, Section 8, Article I, of the Constitution of the United States and in not finding and concluding that said Tax Act, as applied to the plaintiff in its operations, does impose a direct burden on interstate commerce in violation of said constitutional provision.

IV

Because said Court erred in not finding and concluding that the Tax Act violates the Fourteenth Amendment of the Constitution of the United States and Section 3, Article I, of the Constitution of Idaho, in that Section 5 of said Act compels the appropriation and payment of money by the plaintiff for the sole and exclusive benefit of private individuals without compensation of the plaintiff therefor.

V

Because said Court erred in not finding and concluding that said Tax Act violates Section 2 of Article VIII and Section 2 of Article VII of the Constitution of Idaho in that said Tax Act constitutes the levying of a tax for other than a public purpose, to wit: for the benefit of individuals who use electrical energy for the pumping of waters for irrigation purposes on lands in the State of Idaho.

[fol. 282½]

VI

Because said Court erred in not finding and concluding that the Tax Act violates Section 6 of Article VII of the Constitution of Idaho, in that it imposes a tax for the benefit of a municipal corporation, to wit: an irrigation district.

VII

Because said Court erred in not finding and concluding that the Tax Act violates the Fourteenth Amendment of the Constitution of the United States in that it denies the

plaintiff, engaged in the business of generating or producing electricity or electrical energy in the State of Idaho, equal protection of the laws, and deprives the plaintiff of its property without due process of law and likewise violates Section 13, Article I, of the Constitution of Idaho, in that the plaintiff is deprived of its property without due process of law.

VIII

Because the said Court erred in not finding and concluding that the Tax Act violates Article III, Section 16 of the Constitution of Idaho, which provides that every Act shall embrace but one subject and matters properly connected therewith which subject shall be expressed in the title.

IX

Because said Court erred in not finding and concluding that the subject of the Act is not expressed in the title and that the title is deceptive in that the title purports to levy a license tax on electricity and electrical energy generated, manufactured and produced in the State of Idaho for barter, sale or exchange, whereas the Act purports to levy [fol. 283] a tax upon the producer of electrical energy for barter, sale or exchange and a tax on such energy generated or manufactured by him, and as such further violates Article III, Section 16 of the Constitution of Idaho.

X

Because the Court erred in not finding and concluding that the subject of the Act is not expressed in the title in that the title provides that there shall be exempted from the tax the electricity and electrical energy actually used for pumping water for irrigation purposes on lands in the State of Idaho, whereas the Act provides that the full amount of such license tax which would have been due from such producer of electricity shall be so exempt, and as such further violates Article III, Section 16 of the Constitution of Idaho.

XI

Because the Court erred in not finding and concluding that said Tax Act was either (a) a license tax, and as such

constitutes a second license tax imposed in the same year for the same purpose in violation of Article VII, Section 2 of the Constitution of Idaho, or (b) a property tax levied on the kilowatt hour as property and as such violates Article VII, Section 2 of the Constitution of Idaho, which requires a tax to be levied according to valuation, and Article VII, Section 5 of the Constitution of Idaho, which requires such taxes to be uniform.

XII

Because the Court erred in not finding and concluding that the Extraordinary Session of the Legislature of Idaho, at which said Tax Act was passed, was called in violation of Section 9, Article IV of the Constitution of Idaho, for the reasons alleged in Subdivision E of Paragraph 15 of the Bill of Complaint.

[fol. 284]

XIII

Because the Court erred in not finding and concluding that said Tax Act is void and unenforcible for the various uncertainties and ambiguities alleged in the Bill of Complaint, and that the enforcement thereof would constitute taking plaintiff's property without due process of law in violation of the Fourteenth Amendment of the Constitution of the United States.

XIV

Because the said Court erred in making the following Findings of Fact:

(a) That portion of Finding No. II to the effect that "it is a matter of speculation as to where markets will exist in the future for the electrical energy generated by the plaintiff at its said Idaho stations".

(b) That portion of Finding No. V to the effect that "Electrical energy so generated is energy with new and different physical characteristics and new and different uses than energy in other forms" and that the "electrical energy so produced is in the process of generation given certain definite characteristics with reference to voltage, frequency and its character as direct or alternating current as desired and as required by the needs of the customers or the char-

acter of the system"; and that "these characteristics are variable according to the character of the machinery employed"; and that "the process of conversion of energy in the electrical form is completed at the generator before the pulses of energy leave the generator in their flow to the station bus or transformer"; and that "the amount of electrical energy so generated and measured is substantially greater than the amount which plaintiff may deliver to Utah or to any distant point by reason of losses occurring in the subsequent process of transforming the flow of energy to [fol. 285] a different current or voltage in order to transmission, and in and from the transmission line"; and that "the kilowatt-hour is a unit of measurement of a definite physical entity, and of a commercial commodity produced by the plaintiff for transmission, delivery and sale to its customers and/or purchased by the plaintiff from other producers for such transmission, delivery and sale by the plaintiff"; and that "it (the kilowatt-hour) is not the measure of a period of time nor of service".

(c) Further that portion of Finding No. V to the effect that "the transformers are interposed to produce a different current and higher voltage"; and that "such changes in the physical characteristics of the flow of energy from the generator and the production of a separate current are required in order to aid in preparation for transmission and that the same are substantial in character, in that electrical devices or appliances designed to function with the current and voltage at which plaintiff generates would not function with the current and voltage at which the energy flows from the transformer"; and that "similarly, the current and voltage transmitted is not in most instances delivered to the consumer but by the interposition of other transformers, a separate current of lower voltage than that transmitted (and of lower voltage than that produced at the generator) is induced in the transformer coils connected with the distribution lines and delivered to consumers"; and that "such process is necessary in order to the utilization of those devices and appliances used by consumers of electrical energy".

(d) Further that portion of Finding No. V to the effect that "the court finds that it is not true that the system of the plaintiff is purely a transferring device; but that the

[fol. 286] primary and essential function of the generator is to convert energy from the mechanical into the electrical form and to produce an electrical current, and that the primary and essential function of the transformer is to prepare the energy flow for transmission through the induction of a new and separate current of higher voltage which may be economically transmitted"; and that "the consumer receives and must receive both current and power; and that the measurement of electrical power generated and delivered to the consumer is the product of current and voltage. The original source of both electric power and electric current is in the generator.

(e) That portion of Finding No. VI to the effect that "as to each of such stations (stations in Idaho) a use of water is had and enjoyed by plaintiff under permit and license of the State of Idaho"; and that "the electrical energy so obtained by utilization of such power of falling water is in all respects identical with the electrical energy obtained through the utilization of power of burning fuel."

And the making of each of said findings and portions of findings is separately and severally assigned as error.

XV

Because the said Court erred in the following Conclusions of Law:

(a) That said Tax Act does not violate the Fourteenth Amendment of the Constitution of the United States in that it does not deny the plaintiff, engaged in the business of generating or producing electricity and electrical energy in the State of Idaho, equal protection of the laws and does not render its property liable to be taken without due process of law.

[fol. 287] (b) That said Tax Act does not violate the Fourteenth Amendment in that Section 5 does not compel the appropriation and payment of money for the benefit of private individuals.

(c) That said Tax Act does not violate Article III, Section 16, of the Constitution of the State of Idaho, which provides that every Act shall embrace but one subject and matters properly connected therewith, which subject shall

be expressed in the title in that the provisions of said Act are in each necessary particular expressed in the title, and said Act embraces but one subject.

(d) That said Tax Act does not violate Section 13 of Article I of the Constitution of the State of Idaho, in that the plaintiff is not deprived of its property without due process of law.

(e) That said Tax Act does not violate Section 2 of Article VIII and Section 2 of Article VII of the Constitution of the State of Idaho in that said Tax Act does not constitute the levying of a tax for other than a public purpose nor constitute the levying of a tax for the benefit of an individual.

(f) That said Tax Act does not violate Section 6 of Article VII of the Constitution of the State of Idaho in that it does not impose a tax for the benefit of a municipal corporation, to wit: an irrigation district.

(g) That said Tax Act does not constitute a violation of Section 2 of Article VII of the Constitution of the State of Idaho, and that it does not impose a double license tax for the same purpose, in that said Tax Act imposes an excise tax upon the producer of electrical energy for barter, [fol. 288] sale or exchange; whereas the license tax imposed upon plaintiff is a corporate franchise tax for the privilege of existing and doing business in the State as a corporate entity.

(h) That said Tax Act does not violate Section 2 of Article VII of the Constitution of the State of Idaho in failing to provide for the levying of the tax according to valuation, nor Section 5 of Article VII in that it does not provide for the levying of a uniform tax upon the same class of subjects within the territorial limits of the authority levying the tax, nor constitute double taxation, in that said tax is not a property tax but an excise tax.

(i) That said Tax Act does not violate the provisions of Section 9 of Article IV of the Constitution of the State of Idaho, in that the determination of the Governor as to whether or not an extraordinary occasion exists for the calling of the special session of the Legislature is conclusive upon the courts.

(j) That said Tax Act is not void for uncertainties.

(k) That said Tax Act does not violate Clause 3, Section 8, Article I of the Constitution of the United States in that it does not impose a burden upon any act of interstate commerce, that the generation of electrical energy by plaintiff's generation stations is an act of intrastate commerce.

(l) That the defendants are entitled to a decree dissolving the interlocutory injunction heretofore issued in said cause, and requiring the plaintiff to pay the accumulated tax with interest and costs, but without penalties during the pendency of this action.

And the making of each of said Conclusions is separately and severally assigned as error.

[fol. 289] XVI

Because the Court erred in failing to make the following Findings of Fact requested by the plaintiff, to wit:

(a) Finding No. II to the effect that plaintiff's system is operated as a unit, whereby energy in the electrical form is generated, transmitted, distributed and delivered in barter, sale or exchange, to its customers in Idaho, Utah and Wyoming and in interstate commerce; that the generation and transmission of said electrical energy from the State of Idaho to the States of Utah and Wyoming was sold to customers in said States and such generation and transmission was necessary for the performance of Plaintiff's contracts with customers in said States; that the local customers uses in Idaho have been connected to the Idaho generating stations merely to gain economy and service convenience, which, except for these major stations, would be impracticable.

(b) Finding No. III to the effect that plaintiff's "Bear River System" was constructed primarily for the purpose of generating electricity for use in the State of Utah, and that since its construction it has been used almost solely for the purpose of generating electricity which passes without interruption from the Idaho plants on the Bear River to consumers in Utah and Wyoming and substantially all the patrons of the plaintiff who use electricity from these

plants do so under contracts with the plaintiff, which contracts are made and fulfilled outside the State of Idaho.

(c) Plaintiff's proposed Finding No. VI to the effect that the tax imposed by said Tax Act is a license tax upon the producer and no provision is made in said Act for measuring and computing separately the amount of the tax as applied to such electricity as might be used in Idaho [fol. 290] as distinguished from that used in Utah and Wyoming; that plaintiff cannot withdraw from or discontinue its Idaho business.

(d) Finding No. VII to the effect that the various electrical facilities used by the plaintiff in generation and transmission of electrical energy are purely transferring devises, the entire combined process—electric, magnetic and mechanical—is integral, continuous and essentially simultaneous, as electricity travels with the speed of light, one hundred eighty-six thousand miles per second of time.

(e) Finding No. VIII to the effect that there is a continuous electrical and electro-magnetic path between the windings in the generator and the windings in the consumer's motor (or between the generator windings and the filament in an electric lamp or the electrodes in an electro-chemical cell; that the entire electric system is a device for transferring the force (as of falling water) to, and applying it at the point where it is to be utilized.

(f) Finding No. IX to the effect that in the case of the plaintiff's system "electricity and electrical energy", described in the Tax Act, is "generated, manufactured or produced" only if, as and when the com-ined demand of its customers in Utah and Wyoming causes the turbine gates of the Idaho generating stations to open, thus permitting the energy of the falling water exerted within the turbine to be instantly transferred through the electric generator and other parts of the interstate electric system to the customers' motors, lights or other equipment; that each customer's demand occurs just as and when the customer desires, and is effected by his act of switching on lights, motors, ranges and other electrical appliances; that [fol. 291] as the demand is made, the electricity demanded

is instantly, and as an immediate and direct result of said demand, generated at plaintiff's said stations specifically and solely for, and in response to, that demand and use; and that the demands of the plaintiff's various customers in Utah and Wyoming occur on various secondary transmission and distribution lines in said States, which demands are brought partially together through local facilities and completely consolidated at Terminal Station near Salt Lake City, Utah; that there is thus created a continuous combined demand on the Idaho generating stations which exists throughout the Utah-Idaho-Wyoming system; that this combined demand automatically manifests itself on the various generating stations in Idaho, which have been previously placed in readiness for service without point of rest between generation and Terminal Station.

(g) Finding No. X to the effect that the entire process of generation, transmission and use of electrical energy on the plaintiff's system is a continuous, inseparable transfer of energy from the falling water, through the generators, transformers, along the transmission lines, to the customers' points of use in Utah and Wyoming, the transfer of which electrical energy is at the rate of speed of approximately one hundred eighty-six thousand miles per second of time.

(h) Finding No. XI to the effect that there is an absolute interdependence of the consuming devices upon the generator and there can be no generation of electrical energy upon the plaintiff's system except as and to the extent that [fol. 292] such energy is called for and used at the final point of utilization other than that absolutely necessary to hold the electric generator under constant rotation and electric charge in instant readiness to serve.

(i) Finding No. XII to the effect that the difference in amount of electricity generated and that actually used by the consumer constitutes line uses and is necessary and essential in the process of generating, transmitting and using electricity.

(j) Finding No. XIII to the effect that the electrical energy or "kilowatt-hours" produced or generated upon plaintiff's system and in the plaintiff's generators cannot

be stored or reservoired or detained, but is used by the consumer instantly with its generation; that there is no point between generation and use of said electrical energy where the same is detained or brought to rest.

(k) Finding No. XIV to the effect that the power being transferred at any instant along the electric circuit existing between an electric generator at one place and a receiving device at another place is calculable at any point in the circuit from the electrical pressure or voltage between wires and the magnitude and characteristics of the electric current circulating in the wires and is commonly expressed in kilowatts.

(l) Finding No. XV to the effect that the "kilowatt-hour", the usual unit for measuring electricity in the electrical form, is a mathematical product of the power relation in the electric circuit between a generating and receiving device, measured in kilowatts, and the duration of time over which that relation is utilized measured in hours.

[fol. 293] (m) Finding No. XVI to the effect that the "recording watt hour meter or meters, or other suitable instrument for measuring the electricity or electrical energy produced," which is required by said Tax Act to be maintained, "at the point or points of production" on the plaintiff's inter-connected Idaho-Utah-Wyoming system will record, expressed in terms of kilowatt-hours, the mathematical product of the power relation of the electric circuit between the generator of said system in Idaho and the receiving devices in Utah and Wyoming (as their demands are combined at Terminal Station), measured in kilowatts, and the duration of time over which that relation is utilized, measured in hours, including in the measurement, the energy expended in the system, to meet losses and other necessary uses incident to the delivery of energy to such receiving devices.

(n) Finding No. XVII to the effect that the measurement of electrical energy upon which the tax is sought to be imposed by said Tax Act is, and will be, a direct measure of the magnitude and duration of interstate commerce in electrical energy over said system after said commerce has commenced and during the course thereof.

(o) Finding No. XVIII to the effect that the generation of electricity is not the production of a commodity or material thing; it is a part of the process of rendering a service, and no electricity can be commercially generated or produced except as an inseparable part of the service rendered; likewise the "kilowatt-hour" is the measure of such service and not a measure or unit of material thing.

[fol. 294] (p) Finding No. XIX to the effect that there is a marked distinction between electric current and electrical energy or power; that electric current is the carrier for electric power or energy; that electric current is not used or consumed by the consumer but returns again to the generator, leaving behind electric energy or power which is used or consumed by the consumer; that electric current is never bought or sold; that it is electrical energy which is purchased by the consumer; that electric current is measured in amperes, while electric energy is measured in kilowatt-hours—two distinct quantities, not convertible into each other, nor expressible in terms of each other.

(q) Finding No. XX to the effect that the function of a transformer in a hydro-electric system, like that of the plaintiff, is to transform current and voltage such as to give it higher or lower pressure; that it does not in any respect affect or change the power or electric energy; that its use is purely an economic one; that it plays a role similar to that of a set of reduction gears and affects solely the electric current, while the same electrical energy or power which comes from the generator passes through the transformer without change in its physical or other characteristics and that energy which is purchased and used by the consumer is the same energy which leaves the generator and passes through the transformer, along the transmission lines to the consumer's device.

(r) Finding No. XXI to the effect that electrical energy, which is required to be measured by said Tax Act in terms of kilowatt-hours, is precisely the same energy whether it is measured after it leaves the generator or before it enters [fol. 295] the transformer, or measured at any other place along the transmission line between the generator and consumer's device and said measurement cannot be made at

any point except as and when the electrical energy is in motion and passing to its destination.

(s) Finding No. XXII to the effect that generation, transmission and use of electrical energy is an integral, inseparable process and this process is inseparably connected with the fulfillment of contracts for service between the plaintiff and its various customers in Utah, Wyoming and Idaho; that the Tax Act considered in this case cannot operate as against the plaintiff except that it burdens the commerce in electrical energy between the States of Utah, Idaho and Wyoming.

(t) Finding No. XXIV to the effect that Section 5 of said Tax Act compels an appropriation and payment of money of the plaintiff for the sole and exclusive benefit of private individuals and corporations, to wit: Those using electrical energy for pumping water for irrigation purposes, without compensation to the plaintiff therefor; that the effect of the Act is different as Section 5 is held to be valid or invalid and that Section 5 is, therefore, inseparable from the balance of the Act and the Court cannot determine from the Act whether or not it would have been passed by the Legislature had said Section 5 not been included therein.

(u) Finding No. XXV with respect to the issues raised by Paragraph XV of the Bill of Complaint and the Amended Answer thereto, to the effect that:

A

[fol. 295½] 1. Both the title and the Act contain two subjects that is (a) the levying of a license tax for revenue purposes; and (b) the application of credits on electric bills of certain consumers of electricity.

2. That the subject of the Act is not expressed in the title in that the title purports to levy "a license tax of one-half mill per kilowatt-hour on electricity and electrical energy generated, manufactured or produced in the State of Idaho for barter, sale or exchange," whereas the Act purports to levy upon the producer of electrical energy for barter, sale or exchange a tax upon one-half mill on all kilowatt-hours generated, manufactured or produced; that

plaintiff has generated and will continue to generate electrical energy substantially in excess of that generated for barter, sale or exchange, and the tax sought to be levied in the Act is, therefore, substantially different and greater than that expressed in the title;

3. That the subject of the Act is not expressed in the title in that the title provides that there shall be exempted from the tax "the electricity and electrical energy actually used for pumping water for irrigation purposes on lands in the State of Idaho," whereas the Act provides "that the full amount of such license tax which would have been due from the producer of electricity" shall be so exempt; that these quantities are entirely different in that the energy "actually used" is substantially less than the energy taxable at "place of production."

4. That the title of the Act is deceptive in that the subject matter of the Act is not expressed in the title.

B

[fol. 296] That the Act in exempting from the tax the electricity and electrical energy "used for pumping water for irrigation purposes to be used on lands in the State of Idaho" and providing that a sum equal to the tax that would otherwise be paid by the producer shall be paid to the consumer, constitutes the levying of a tax for other than a public purpose, to wit: A tax for the benefit of an individual, and furthermore imposes a tax for the benefit of municipal corporations, to wit, irrigation districts which pump water by means of electricity supplied by the plaintiff for irrigation purposes.

C

That said Tax is a license tax and constitutes a second license tax imposed in the same year for the same purpose in that the plaintiff has heretofore been required to pay a license tax as provided by statutes of the State of Idaho heretofore enacted by said State, the payment of which tax is conditioned upon plaintiff's right to do business in the State as a corporation.

D

That the tax imposed, or attempted to be imposed by the Tax Act, is a license tax, or in lieu thereof that said tax be definitely described and defined.

E

That the Extraordinary Session of the Legislature of Idaho, at which said Act was passed, convened pursuant to a call made prior to the adjournment of the Regular Session of the Legislature, and for the purpose of considering matters that had theretofore been considered at the [fol. 297] Regular Session of said Legislature; that said Regular Session had made all appropriations necessary for the ensuing biennium and had levied a general ad valorem tax sufficient to meet all expenses of the Government of said State for said biennium and that no extraordinary occasion existed justifying the calling of the Extraordinary Session of the Legislature of said State.

(v) Finding No. XXVI to the effect that said Tax Act is uncertain and ambiguous in the particulars alleged in Plaintiff's Bill of Complaint and as particularly set out in detail in said proposed Finding No. XXVI.

(w) Finding No. XXVII to the effect that the Tax Act is levied upon the producer of electrical energy measured but that energy produced for barter, sale or exchange, exclusive of energy used by the plaintiff for its various uses, including station uses, and also exclusive of transmission or line uses; that the measure of said tax is that energy actually sold or delivered to the customer or consumer for compensation.

(x) Finding No. XXVIII to the effect that except for this suit the defendants will attempt to enforce through appropriate action the fines and penalties prescribed in the Tax Act; that such action would result in a multiplicity of suits; that the penalties are so unreasonable, burdensome and excessive that plaintiff could not safely refuse to pay the tax without instituting this action and that there is no provision of the statutes of Idaho under which plaintiff could pay the tax under protest and recover back the amount so paid, but any payment so made would be credited

to the general fund of the State and its reimbursement [fol. 298] could not be effected except through a subsequent Act of the Legislature.

And failure to make each of said Findings is separately and severally hereby assigned as error.

XVII

Because the said Court erred in failing to make the following Conclusions of Law requested by the plaintiff:

(a) That the plaintiff is entitled to maintain this suit for injunctive relief to test the validity of said Tax Act.

(b) That said Tax Act violates the Fourteenth Amendment of the Constitution of the United States in that Section 5 of said Act compels the appropriation and payment of money by the plaintiff for the sole and exclusive benefit of private individuals without compensation to the plaintiff therefor.

(c) That said Section 5 cannot be eliminated from said Tax Act without destroying the entire Act.

(d) That said Tax Act violates Article III, Section 16, of the Constitution of the State of Idaho, which provides that every Act shall embrace but one subject and matters properly connected therewith, which subject shall be expressed in the title in that:

(1) Both title and act contain two subjects, viz., (a) levying a tax for revenue purposes and (b) the application of credits on the electric bills of certain consumers of electricity.

(2) The subject of the Act is not expressed in the title in that the title purports to levy a tax on electricity generated for barter, sale or exchange, whereas, the Act purports to levy the tax upon the producer of electricity for barter, sale or exchange on all electricity generated by such producer.

[fol. 299] (3) The subject of the Act is not expressed in the title in that the title exempts from the tax electrical energy actually used for pumping water for irrigation purposes on lands in the State of Idaho, whereas, the Act pro-

vides that the full account of such tax which would have been due from the producer shall be exempt.

(e) That said Tax Act, in exempting therefrom the tax on electrical energy "used for pumping water for irrigation purposes to be used on land in the State of Idaho" and providing that a sum equal to the tax that would otherwise be paid by the producer shall be paid to the consumer, is void because it violates the following provisions of the Constitution of the State of Idaho, to wit:

(1) Section 13 of Article I of said Constitution, which provides that no person shall be deprived of property without due process of law.

(2) It constitutes the levying of a tax for other than a public purpose, to wit: for the benefit of an individual in violation of Article VIII, Section 2, and Article VII, Section 2 of said Constitution.

(3) It imposes a tax for the benefit of municipal corporations, to wit: irrigation districts which pump water by means of electricity supplied by the plaintiff for irrigation purposes, in violation of Article VII, Section 6, of said Constitution, which provides that the Legislature shall not impose taxes for the purposes of municipal corporations.

(f) That said Tax Act constitutes a violation of Section 2 of Article VII of the Constitution of the State of Idaho, in that it imposes a double license tax and fails to provide for the levying of the tax according to valuation; the tax violates Section 5 of Article VII of the Constitution of the State of Idaho, in that it fails to levy a uniform tax on same class of subjects within the territorial limits of said State.

[fol. 300] (g) That said Tax Act violates the provisions of Section 9 of Article IV of the Constitution of the State of Idaho in that at the time the Extraordinary Session of the Legislature was called no extraordinary occasion existed for calling said session.

(h) That said Tax Act is further void for the uncertainties and ambiguities recited in these Findings, which cannot be harmonized and construed together.

(i) That said Tax Act violates Clause 3, Section 8, Article I, of the Constitution of the United States, in that it imposes a direct burden upon the interstate commerce conducted and engaged in by the plaintiff in the generation, transmission, sale and use of electrical energy.

(j) That it is impossible to segregate the tax attempted to be imposed by said Tax Act and measured by the intrastate business done by the plaintiff from that measured by the intersate business done by said plaintiff; that said Tax Act, in attempting to impose a tax upon interstate business, is void as to such business, and, because of its inseparability from intrastate business, is void in its entirety as the same applies to this plaintiff.

(k) That the plaintiff is entitled to a decree declaring said Tax Act unconstitutional and void, and for a permanent injunction perpetually restraining the defendants from enforcing the same.

[fol. 301] And error is separately and severally assigned on the refusal to make each of said conclusions.

XVIII

Because the evidence as a whole and particularly that evidence showing the process of generation, transmission and use of electrical energy upon the plaintiff's system and the manner and method of plaintiff's operation in the generation, transmission and sale of electrical energy in and between the States of Idaho, Utah and Wyoming failed to support the Findings of Fact made and entered by the Court and the Conclusions of Law drawn therefrom and the Decree based thereon but require the Findings proposed by the plaintiff and the Conclusions of Law and Decree requested by it.

Prayer for Reversal

Wherefore, for the errors aforesaid, the plaintiff, Utah Power & Light Company, a corporation, prays that the said Decree of the United States District Court for the District of Idaho, Southern Division, dated on the 8th day of February, 1932, and filed in the above entitled cause on the 15th day of February, 1932, be reversed and that said

District Court be directed to enter Decree in favor of the plaintiff as prayed for in its Bill of Complaint, and for costs.

Dated this 16th day of February, 1932, and filed with Plaintiff's Petition for Appeal.

John F. MacLane, Geo. R. Corey; Hawley & Worthwine, Merrill & Merrill, Solicitors for Plaintiff.

[fol. 302] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT, DISTRICT OF IDAHO, SOUTHERN DIVISION

In Equity. No. 1621

UTAH POWER & LIGHT COMPANY, a Corporation, Plaintiff,

against

EMMITT PFOST, Commissioner of Law Enforcement of the State of Idaho, and Fred J. Babcock, Attorney General of the State of Idaho, Defendants

ORDER ALLOWING APPEAL—Filed Feb. 17, 1932

The Utah Power & Light Company, a corporation, plaintiff and appellant in the above entitled suit, having prayed for the allowance of an appeal in this cause to the Supreme Court of the United States from the decree dated February 8th, 1932, and entered on the 15th day of February, 1932, in the above entitled suit by the United States District Court for the District of Idaho, Southern Division, with Hon. W. H. Sawtelle, Circuit Judge, and Hon. J. Stanley Webster and Hon. Charles C. Cavanah assembled as a three judge statutory court, and from each and every part of said decree, and having presented and filed its Petition for Appeal, Assignment of Errors, and Prayer for Reversal, pursuant to the Statutes and the rules of the Supreme Court of the United States in such case made and provided:

It is now here ordered that an appeal be, and the same is hereby allowed to the Supreme Court of the United States from the District Court of the United States for the District of Idaho, Southern Division, in this cause, as provided by

law, and it is further ordered that the Clerk of the Court appealed from shall prepare and certify copy of the Transcript of the Record, testimony, exhibits, stipulations, findings, decree and all proceedings in this cause, and transmit [fols. 303-307] the same to the Supreme Court of the United States, so that he shall have the same in said Court within sixty days of this date.

It is further ordered that the Interlocutory Injunction heretofore granted herein remain in force and effect pending appeal upon plaintiff giving bond in the sum of $82,500.00 with proper surety or sureties, to be approved by the Court, and that said bond act as a bond for cost on this appeal and as a supersedeas.

Dated this 16th day of February, 1932.

Charles C. Cavanah, Judge United States District Court, District of Idaho.

[fol. 308] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

STIPULATION IN LIEU OF PRÆCIPE—Filed Feb. 17, 1932

It is hereby stipulated and decreed by and between the above named parties, through their Solicitors of record, that in lieu of the filing of a Præcipe and counter præcipe herein that the following portions of the record shall be included in the transcript of the above entitled cause to be transmitted by the Clerk of the above entitled Court to the clerk of the Supreme Court of the United States, to wit:

1. Bill of Complaint.
2. Application for Interlocutory Injunction.
3. Subpœna ad Respondendum and return thereon.
4. Notice of Hearing of Application for Interlocutory Injunction and Order of Court with Return of Service on defendants and upon C. Ben Ross, Governor, State of Idaho.
5. Motion to dismiss.
6. Order denying Motion to dismiss.
6a. Minute entry of July 2, 1931.

[fol. 309] 7. Opinion of Court entered August 20, 1931, reported 52 Fed. (2d) 226.

8. Interlocutory Injunction.

9. Stipulation as to right of defendants to file Amended Answer.

10. Amended Answer.

11. Opinion entered December 30, 1931.

12. Motion of Plaintiff to Make and Enter Findings of Fact and Conclusions of Law with ruling of Court thereon.

13. Exceptions of Plaintiff to Refusal of Court to Make and Enter Findings of Fact and Conclusions of Law Proposed By Plaintiff and Exceptions To Findings and Conclusions Made and Entered and Decree Thereon.

14. Order Allowing Exceptions.

15. Findings of Fact and Conclusions of Law.

16. Decree.

17. Supersedeas Order.

18. Transcript of Evidence Settled and Allowed February 15, 1932 and fifty copies of Diagrammatic Map.

19. Petition for Appeal.

20. Assignment of Errors and Prayer for Reversal.

21. Order Allowing Appeal.

22. Copy of Bond on Appeal and Supersedeas.

23. Citation and Admission of Service.

24. This Stipulation.

It is further stipulated that paragraphs numbered one to twenty-four, inclusive, of "Exceptions of Plaintiff to Refusal of Court to Make and Enter Findings of Fact and Conclusions of Law Proposed by Plaintiff and Exceptions to Findings and Conclusions Made and Entered and Decree Thereon," which exceptions were duly allowed, are exceptions taken by the plaintiff to the refusal of the Court to make and enter Findings of Fact tendered by it and specif-
[fols. 310 & 311] ically recited in paragraph No. XVI of the Assignment of Errors and such exceptions are sufficient to present for review all matters assigned as error in paragraph No. XVI of said Assignment of Errors and to avoid repetition and shorten the printed record, paragraphs one to twenty-four, inclusive, of said "Exceptions" etc. may be omitted from the printed record and said Assignment reviewed with like effect as if said paragraphs one to twenty-four were printed at length.

It is further stipulated that there will be no counter præcipe by the defendants and appellees, and that the clerk of the above entitled Court may forthwith and without delay certify and transmit to the Supreme Court of the United States a transcript of the record as herein stipulated.

Dated this 17th day of February, 1932.

Hawley & Worthwine, Merrill & Merrill, John F. MacLane, Geo. R. Corey, Solicitors for Plaintiff.
Fred J. Babcock, Sidman I. Barber, Maurice H. Greene, Solicitors for Defendants.

[fol. 312] IN SUPREME COURT OF THE UNITED STATES

STATEMENT OF POINTS TO BE RELIED UPON AND DESIGNATION OF PARTS OF THE RECORD TO BE PRINTED—Filed Feb. 23, 1932

Comes now the appellant in the above entitled cause, and states that the Points upon which it intends to rely in this Court, in this case, are as follows:

Point I

That the special statutory court, sitting in the District Court for the District of Idaho, Southern Division, (hereinafter referred to as the court), erred in dismissing appellant's Bill of Complaint, dissolving the Interlocutory Injunction theretofore issued, ordering payment of the tax required bythe Tax Act described in the Bill of Complaint, and in refusing to decree a permanent injunction restraining enforcement of said Tax Act, as against the appellant, the specific grounds of such error being hereinafter stated (Assignment of Error No. I).

[fol. 313] Point II

The Court erred in finding and concluding that the Tax Act, as applied to the appellant and its operations, does not impose a direct burden on interstate commerce, in violation of Clause 3, Section 8, Article I of the Constitution of the United States (Assignment of Error No. III).

In the presentation and argument of this Point, appellant specifically relies upon and will present to the Supreme Court, the errors in the Findings of Fact and Conclusions of Law, the making of which is assigned as error in Paragraphs Numbered XIV, and XV Subdiv. k, of the Assignment of Errors, and the failure and refusal of the Court (the special statutory court, as aforesaid) to make the Findings of Fact and Conclusions of Law requested by the appellant in its motion therefor, such failures and refusals being specifically set forth in Paragraphs Numbered XVI Subdivisions a to s inclusive, and XVII Subdiv. i, and XXVIII of the Assignment of Errors.

And appellant adopts said paragraphs of said Assignment of Errors, and each subdivision thereof, as a part of this Point, or as sub-points hereunder, as though the same were set forth at length herein.

Point III

The Court erred in not finding and concluding that the Tax Act denies appellant equal protection of the laws and deprives appellant of its property without due process of law, in violation of the Fourteenth Amendment of the Constitution of the United States, and also Section 13 of Article I of the Constitution of the State of Idaho, in that Section [fol. 314] 5 of said Act compels the appropriation and payment of money by appellant for the sole and exclusive benefit of private individuals without compensation to appellant therefor (Assignment of Errors Numbered IV and VII).

In the presentation and argument of this Point appellant further relies upon and will present to the Supreme Court the errors in the Conclusions of Law, the making of which is assigned as error in Paragraph Numbered XV Subdivisions a, b and d, of the Assignment of Errors, and the failure and refusal of the Court to make the Findings of Fact and Conclusions of Law on this point requested by appellant in its Motion therefor, such failures and refusals being specifically set forth in Paragraphs Numbered XVI, Subdivision t, and XVII, Sudivisions b, c and e, of the Assignment of Errors.

And the Appellant adopts said paragraphs of said Assignment of Errors and each subdivision thereof as part of this Point or as sub-points hereunder as though the same were set forth at length herein.

Point IV

That the Court erred in not finding and concluding that the Tax Act violates Section 2 of Article VIII, and Section 2 of Article VII of the Constitution of the State of Idaho, in that said Tax Act constitutes the levying of a tax for other than a public purpose, to wit: for the benefit of an individual (Assignment of Error No. V). The Court also erred in not finding and concluding that the Tax Act violates [fol. 315] Section 6 of Article VII of the Constitution of the State of Idaho in that it imposes a tax for the benefit of municipal corporations, to wit: irrigation districts (Assignment of Error No. VI).

In the presentation and argument of this Point, appellant herein further relies upon and will present to the Supreme Court, the Errors in the Conclusions of Law, the making of which is assigned as error in Paragraph No. XV, Subdivisions e, f, g and h, of the Assignment of Errors, and the failure and refusal of the Court to make the Findings of Fact and Conclusions of Law on this Point requested by the appellant in its Motion therefor, such failures and refusals being specifically set forth in Paragraphs Numbered XVI, Subdiv. t, and Subdiv. u B, and XVII, Subdiv. e, of the Assignment of Errors.

And Appellant adopts said paragraphs of said Assignment of Errors and the Subdivisions thereof as a part of this Point, or as sub-points hereunder, as though the same were set forth at length herein.

Point V

That the Court erred in not finding and concluding that the Tax Act violates Section 16 of Article III of the Constitution of the State of Idaho, which provides that every Act shall embrace but one subject and matters properly connected therewith, which subject shall be expressed in the title (Assignment of Error Numbered VIII, IX and X).

In the presentation and argument of this Point, appellant further relies upon and will present to the Supreme Court, the Errors in the Conclusions of Law, the making of which [fol. 316] is assigned as error in Paragraph Numbered XV, Subdiv. c, of Assignment of Errors, and the failure and refusal of the Court to make the Findings of Fact and Conclusions of Law requested by appellant in its Motion there-

for, such failures and refusals being specifically set forth in Paragraphs Numbered XVI, Subdiv. u A, and XVII, Subdiv. d, of the Assignment of Errors.

And appellant adopts said Paragraph of said Assignment of Errors and each subdivision thereof as a part of this Point, or as sub-points hereunder, as though the same were set forth at length herein.

Point VI

That the Court erred in not finding and concluding that the Tax Act is void and unenforcible for the various uncertainties and ambiguities alleged in the Bill of Complaint, and that the enforcement thereof would constitute taking plaintiff's property without due process of law, in violation of the Fourteenth Amendment of the Constitution of the United States (Assignment of Error No. XIII).

In the presentation and argument of this Point, appellant further relies upon, and will present to the Supreme Court, the error in the Conclusion of Law, the making of which is assigned as error in Paragraph No. XV, Subdiv. j, of the Assignment of Errors, and the failure and refusal of the Court to make the Findings of Fact and Conclusions of Law on this Point requested by appellant in its Motion therefor, such failures and refusals being specifically set forth in Paragraphs Numbered XVI, Subdivisions v and w, and XVII, Subdiv. h, of the Assignment of Errors.

[fol. 317] And appellant adopts said Paragraphs of said Assignment of Errors and each subdivision thereof as a part of this Point, or as sub-points hereunder, as though the same were set forth at length herein.

Point VII

That the Court erred in not finding said Tax Act void, as applied to the plaintiff and its operations, for each of the reasons herein recited, and in not also finding and concluding that Section 5 of said Tax Act cannot be eliminated from said Tax Act without destroying the entire Act, and that it is impossible to segregate the tax attempted to be imposed by the said Tax Act and measured by the intrastate business done by the appellant from that measured by the interstate business done by the appellant, and that

said Tax Act, because of the inseparability of the intrastate business and the interstate business, is void in toto.

Point VIII

The evidence as a whole, and particularly that evidence showing the process of generation, transmission and use of electrical energy upon the appellant's system and the manner and method of appellant's operations in the generation, transmission and sale of electrical energy in and between the States of Idaho, Utah and Wyoming, fails to support the Findings of Fact made and entered by the Court and the Conclusions of Law drawn therefrom and the Decree based thereon, but require the Findings proposed by the appellant and the Conclusions of Law and Decree requested by it to be made and entered (Assignment of Errors No. XVIII).

[fol. 318] And the appellant further states that only the following parts of the record, as filed in this Court, need be printed by the Clerk for the hearing of the case:

Title of paper	Pages of certified record
Bill of Complaint	3–19
Motion to Dismiss	27–31
Opinion of Court entered August 20, 1931	33–49
Order Denying Motion to Dismiss	50
Stipulation as to Right of Defendants to File Amended Answer	54–55
Amended Answer	56–79
Opinion entered December 30, 1931	80–89
Motion of Plaintiff to Make and Enter Findings of Fact and Conclusions of law, with Ruling thereon	90–110
Exceptions of Plaintiff to Refusal of Court to Make and Enter Findings of Fact and Conclusions of Law Proposed by Plaintiff and Exceptions To Findings and Conclusions Made and Entered and Decree Thereon (Except paragraphs one to twenty-four, inclusive, which may be omitted)	111–126
Order Allowing Exceptions	127
Findings of Fact and Conclusions of Law	128–145
Decree	146–147

Title of paper	Pages of certified record
Transcript of Evidence Settled and Allowed February 15, 1932	150–279
Petition for Appeal	280
Assignment of Errors and Prayer for Reversal	281–301
Order Allowing Appeal	302–303
Stipulation in Lieu of Præcipe	308–310
Statement of Points to be Relied Upon and Designation of Parts of Record to be printed.	

[fol. 319] Please omit all repetitions of title and note, in the printed record, the omission of the various instruments mentioned in the Stipulation in Lieu of Præcipe and certified to the Clerk of the Supreme Court.

Dated this 23rd day of February, 1932.

John F. MacLane, Solicitor for Appellant.

[fol. 320] Service of copy of foregoing is hereby duly admitted and the undersigned, Solicitors for the Respondents, represent that the record to be printed, as above requested, is sufficient and the same may be printed without waiting for any counter-designation.

Dated this 23rd day of February, 1932.

Fred J. Babcock, Sidman D. Barber, Maurice H. Greene, Solicitors for Respondents.

[fol. 321] [File endorsement omitted.]

Endorsed on cover: File No. 36,536. Idaho D. C. U. S. Term No. 722. Utah Power and Light Company, appellant, vs. Emmitt Pfost, Commissioner of Law Enforcement of the State of Idaho, et al. Filed February 23, 1932. File No. 36,536.